Effective User Experience in Online Technical Communication Courses: Employing Multiple Methods within Organizational Contexts to Assess Usability

Marjorie Rush Hovde
Indiana University-Purdue University
Indianapolis
ET 324F, 799 W. Michigan Street
Indianapolis, IN
1-765-274-0825
mhovde@iupui.edu

ABSTRACT

In teaching online technical communication courses, shaping an electronic interface requires extensive consideration of the user experience, both for students and for faculty members who design and teach the courses. Technical communication faculty members should provide strong examples of effective user experiences and should be leaders in making the interfaces of online learning management systems as usable as possible.

Principles of usability designed for general web sites may or may not apply to learning management systems designed for educational purposes. In order to create effective online technical communication courses, one needs to consider both usability concerns and pedagogical concerns.

To assess the usability and pedagogical effectiveness of online courses, faculty members may use indirect means such as heuristic analyses. In addition, they may use direct means such as usability testing, student feedback, and analytic tools. Each approach has advantages as well as limitations. Faculty members will gain the richest information through using multiple approaches.

In assessing usability and pedagogical effectiveness, faculty members also need to consider the situational constraints and resources in their unique contexts. Understanding and adapting their approaches to use resources well and to work within constraints will benefit their abilities to enhance their student users' experiences with online courses.

Categories and Subject Descriptors

H.5.2 **User Interfaces** – user-centered design

K.3.1 **Computer Uses in Education** – distance learning

General Terms

Human Factors

SIGDOC '15, July 16-17, 2015, Limerick, Ireland
ACM 978-1-4503-3648-2/15/07.
http://dx.doi.org/10.1145/2775441.2775453

Keywords

User interface, Learning management systems, Teaching technical communication, Heuristics, Usability testing, Online course usability.

1. INTRODUCTION

In online technical communication courses, designing the interface requires extensive consideration of the user experience for students and for faculty members who design and teach the courses. Technical communication faculty members should provide strong examples of effective user experiences and should be leaders in making the interfaces of online learning management systems (LMS) as usable as possible. A usable interface in an LMS can help to overcome some of these challenges and provide a worthwhile user experience. Within organizational contexts, technical communication faculty members need to consider the resources they might use to enhance usability while also taking into account the constraints of their situations that might limit the level of usability they are able to achieve.

2. PEDAGOGICAL AND USABILITY CONCERNS IN ONLINE COURSES

One challenge in considering usability in online courses is that the typical principles of usability for online material relate to general situations, such as those found in commercial websites, but learning situations have additional dimensions of usability, beyond those found in web sites designed for other purposes [1].

In online courses, faculty members need to complete tasks such as "Facilitating discussions, sharing documents, calendaring/ managing the course, and tracking learning progress" [1, p. 3]. Faculty members also arrange for student access to information, offer social interactions within the course, provide for student contributions, and allow for student learning experiences. Student and faculty users in online courses have to manage many levels of functioning, so a usable interface is a great boon. Learners need to move from their goals for learning and activities to the design of the interface, which should not pose a barrier to achieving their goals. [1].

Indeed, "If the interface is not transparent and easy to use, the learners/students concentrate on interaction aspects and not on acquiring content" in online courses [2, p. 107]. In addition, the levels of usability and satisfaction may depend on students' IT skills

This is the author's manuscript of the article published in final edited form as:
Hovde, M. R. (2015). Effective User Experience in Online Technical Communication Courses: Employing Multiple Methods Within Organizational Contexts to Assess Usability. In Proceedings of the 33rd Annual International Conference on the Design of Communication (p. 30:1–30:5). New York, NY, USA: ACM. http://doi.org/10.1145/2775441.2775453

and previous experience with the interface [2, p. 119). Designers need to think about usability and educational aspects together when shaping online course interfaces. [2, p. 118).

Fortunately, several people have begun address these challenges through use of heuristics and usability testing, as well as other means of determining the usability of an online course's interface. Each approach offers advantages as well as limitations; faculty members need to consider their situational resources and constraints as they explore multiple means of assessing usability.

Below, I discuss several approaches to assessing online course usability, followed by a discussion of how faculty members can apply these approaches within organizational constraints and resources. Insights from my recent experiences follow, providing concrete examples of considering both pedagogical concerns and usability concerns in designing online course interfaces.

3. EMPLOYING HEURISTICS TO EVALUATE THE USABILITY OF ONLINE COURSE INTERFACES

Heuristics designed for online learning [1], [3] can inform design decisions relevant to the user experience in online course. In designing heuristics, practitioners need to develop "rigorous, replicable principles for the design of e-learning environments and instructional materials" [1, p. 2].

Some heuristics have a limited scope, limiting their usefulness for assessing usability in an online course. For instance, the Quality Matters Rubric, Fifth Edition, only lists a few standards to consider in evaluating the usability of an online course. In a section entitled "Accessibility and Usability," the topics include only general considerations including

> "Course navigation facilitates ease of use.
> Information is provided about the accessibility of all technologies required in the course.
> The course provides alternative means of access to course materials in formats that meet the needs of diverse learners.
> The course design facilitates readability.
> Course multimedia facilitate ease of use." [4].

While "ease of use," "accessibility," and "readability" are important components of usability, they do not cover the multiplicity of features that make an online course usable. While other sections of the QM rubric address the pedagogical nature of online courses, a richer heuristic is needed to guide the design of a usable LMS interface.

Nielsen's [5] well-known and widely used heuristics for web sites may not be adequate for providing guidance for designing the interface of an online course. Nielsen himself calls them "broad rules of thumb and not specific usability guidelines." His heuristics include

> "Visibility of system status
> Match between system and the real world
> User control and freedom
> Consistency and standards
> Error prevention
> Recognition rather than recall
> Flexibility and efficiency of use
> Aesthetic and minimalist design
> Help users recognize, diagnose, and recover from errors
> Help and documentation" [5]

Despite the general nature of Nielsen's heuristics, Shih, *et al.* [6] use them as a basis for designing one aspect of an educational interface. Granića and Ćukušić also utilize Nielsen's heuristics as one set of criteria (among four) employed by experts in HCI and e-learning to evaluate the usability of an online LMS.

A richer list of usability heuristics, specifically tailored for educational interfaces, is provided by Mehlenbacher, *et al*. [1], providing guidance for designers and reviews of online courses. Major categories include

> **"Learner Background and Knowledge**
> *Accessibility*
> *Customizability and maintainability*
> *Error support and feedback*
> *Navigability and user movement*?
> *User control, error tolerance, and flexibility*
> **Social Dynamics**
> *Mutual goals and outcomes*
> *Communication protocols*
> **Instructional Content**
> *Completeness*
> *Examples and case studies*
> *Readability and quality of writing*
> *Relationship with real-world tasks*
> **Interaction Display**
> *Aesthetic appeal*
> *Consistency and layout*
> *Typographic cues and structuring*
> *Visibility of features and self-description*
> **Instructor Activities**
> *Authority and authenticity*
> *Intimacy and presence*
> **Environment and Tools**
> *Help and support documentation*
> *Metaphors and maps*
> *Organization and information relevance*
> *Reliability and functionality*"
> [1, p. 7-9].

In the ten years since Mehlenbacher, *et al.* was published, the use of mobile devices has expanded, so an updated version of their rich and complex heuristics might consider the usability of the online course in a mobile environment.

To be useful for evaluating the usability of online courses, heuristics need to integrate usability principles with sound pedagogical principles. At this time, there is no widely accepted set of principles, but foundations have been laid for their development. However, even the most effective expert heuristic analysis can provide only part of the insights needed for assessing the usability of online courses.

One limitation of relying solely on heuristics in designing educational interfaces is that heuristics do not take into consideration how learners decide to interact with the system in order to learn. Another limitation is that instructors may place poorly-considered content into an otherwise usable system. [2, p. 117.] Additional means are necessary for creating an optimally usable online course. Approaches that are more direct, including usability testing, can provide richer insights, as discussed next.

4. EMPLOYING USABILITY TESTING AND OTHER DIRECT MEANS TO

EVALUATE THE USABILITY OF ONLINE COURSE INTERFACES

Conducting usability-testing and other direct means can help instructors evaluate specific, situated interface designs for their usability [1], [6], bringing in dimensions that heuristic analysis cannot address. In fact, in one case, "Although many interface problems were identified by expert reviews, it was the user testing that enabled us to determine which problems actually impeded the users' (students' and teachers') ability in successful task completion" [2, p. 120].

Using multiple methods is a well-accepted approach for determining usability; "We assumed that the usability testing complemented with inspections that rely upon experts judging the interface compliance with recognized usability principles along with considerations of educational perspective would provide a more accurate evaluation" [2, p. 110]. Faculty members with limited resources may need to select the approach or approaches that best use those resources in assessing online course usability.

Methods that Granića and Ćukušić employed in their usability evaluations of a European LMS included questionnaires for users to report their previous experience with IT and the LMS under study, memory tests, attitude questionnaires and semi-structured interviews after usability testing, and evaluators' notebooks recording task completion during end-user testing. [2, p. 110-111]. In their study, Granića and Ćukušić conducted task-based usability testing on the LMS prototype with 47 teen-aged students and 23 teachers at 9 locations [2], thus leading to richer insights. However, this extensive research may fall beyond the scope of the time and funding that many faculty members can access.

In Shih *et al.*'s study [6], participants were asked to interact with animated hierarchical maps in an LMS and complete a questionnaire that asked about their opinions and reactions to that feature of the interface. In addition, they completed a post-test to assess their memory of the content of the hierarchical maps. These approaches supplemented Shih's group's use of Nielsen's heuristics in the design of the hierarchical maps to evaluate the usability of this feature of the LMS.

Usability testing, however, suffers from the limitation that it consumes a good amount of time and resources in planning, administering, and analyzing results. I argue, however, that it is time well invested. Even minimal testing can provide results that will benefit designers of courses within an LMS.

Additional direct means such as student feedback or online analytics can help course designers understand features of online course that lead to enhanced usability and learning. Student feedback can provide insights from actual users of the LMS, employing it in a variety of circumstances and in the contexts of actual learning goals and activities. However, relying solely on this feedback means that faculty members are gaining insights after the fact – suggestions for improvement might apply to future versions of the course, but problems will be likely to remain in the current course and may inhibit student learning and satisfaction.

Online analytics can also provide useful insights. Many LMSs today have built-in options for viewing usage statistics which may prove useful to faculty members. However, one limitation is that these statistics provide only limited information about user behavior. For instance, faculty members may be able to see that a student spent 20 minutes on a quiz that should have taken only 10 minutes, but the reason for the extended time is unknown. Perhaps the student did not know the material, perhaps the student encountered technical difficulties, perhaps the student was interrupted, or perhaps the quiz was not well designed – reasons are not available through only studying the usage statistics. Hence a variety of direct approaches is advisable for gaining rich insights.

Despite the limitations of direct means of assessing usability, faculty members would be wise to combine the heuristic approaches discussed in the previous section with the direct means discussed in this section. In doing so, they need to consider their unique contextual constraints and resources as they attempt to assess the effectiveness of online course usability and pedagogical soundness, as discussed in the next section.

5. CONSIDERING CONTEXTUAL CONSTRAINTS AND RESOURCES WHEN WORKING TO ENHANCE ONLINE COURSE USABILITY

Ideally, one would begin usability evaluations and/or testing early in the process of designing online course interfaces and continue throughout, [2][6] but that ideal is seldom achieved, often owing to situational constraints.

Within educational contexts, technical communication faculty members need to consider the feasibility of completing processes that may lead to greater usability of online courses. Given that faculty members often face limited resources of time, technical background, freedom to alter the interface, etc., they need to consider what is possible within organizational constraints. At times, they may take small steps, and at other times, they may be able to take larger ones to improve usability.

Overall, technical communication faculty members are in a position to understand usability and to collect data that support arguments for improved usability of online courses. Specifically, faculty members need to consider administrative and political constraints and resources which will vary across institutions.

5.1 Utilizing Resources.

Carrying out extensive heuristic analysis and/or more direct usability measures requires access to appropriate resources. For instance, Granića and Ćukušić's far-reaching study was funded by their national government's educational agency, and Shih, *et al.*'s study was funded by their National Science Council. One source of support for the time and energy needed to assess usability can be external grants, but another source can be internal grants. For instance, I have been involved in two campus-level Curriculum Enhancement Grants funded by the Center for Teaching and Learning on my campus that not only allowed me to develop new online courses, but to conduct small-scale efforts toward making them as usable as possible.

In a context of limited resources, faculty members can also create class assignments for technical communication students that asks them to apply heuristic analysis and/or more direct approaches to assess the usability of the LMS they are using. The assignment can aid students in learning more about usability and its assessment, and the results can provide the faculty members with insights useful in revising future online courses.

Institutions that are interested in expanding online learning would be wise to invest resources in offering high quality courses that lead to their long-term success, and technical communication faculty members can base their arguments on this goal when advocating for resources that will provide feedback that can lead

improved usability in an LMS interface. Faculty members would be wise to seek out institutional resources, however limited, to assist them in making initial steps toward improving usability.

5.2 Addressing Constraints

Even with good access to resources, faculty members may face multiple constraints when they try to improve the usability of online courses. However, with careful thought and planning, many of these constraints can be addressed.

One constraint is that the LMS may be designed by someone else and may not offer good usability or an appropriate pedagogical approach within its interface. Technical communication faculty members using an LMS designed by someone else may not have interfaces that provide optimal usability [8] [9].

Additionally, unique courses or disciplinary circumstances may require pedagogical approaches that interface designers did not build in to the LMS. For instance, the LMS may have been designed for a course that emphasized "attendance and re-presentation of lecture notes rather than interaction, peer review, and authorship" [9, p. 2], the latter being features of many technical communication courses.

While no single approach to addressing constraints fits every situation, technical communication faculty members would do well to persist in finding ways to address these constraints. One approach that I recommend is to attempt to influence the design of the LMS early in the process if possible in order to enhance usability. Another is to provide feedback to the LMS designers in whatever form is available. For instance, our institution recently began offering Instructure's Canvas to replace the older LMS that we had been using for many years. Fortunately, Canvas has a means by which users can submit suggestions for change and can vote on other people's suggestions for change. Ideally, if a suggested change has many votes, the designers will attempt to implement the change.

In situations of limited resources, employing heuristic approaches often consumes less time and energy than more direct measures. While heuristics' results may be less useful than results from more direct measures, it may be necessary to begin with heuristics and make modifications to an online course based on the results, all the while creating arguments for more extensive resources that could provide measures that are more direct and thus yield richer insights into usability.

Overall, I encourage technical communication faculty members to utilize their persuasive skills and knowledge of usability to encourage improvements in existing LMS. And while there may be high-level matters that the faculty members do not have the authority to alter, they can work within the existing design to make the courses as task-oriented as well as straightforward as possible for the benefit of students.

For instance, on a small scale, Mehlenbacher, *et al.* [1] recommend that the writing style of instructional material in online course consider these standards: "Is the text in active voice and concisely written (> 4 < 15 words/sentence)? Are terms consistently plural, verb+object or noun+verb, etc., avoiding unnecessarily redundant words? Can users understand the content of the information presented easily?" [1, p. 8]. Technical communication faculty members have the ability to write materials that meet these standards within the larger design of the interface. And even a simple change such as wording can play an important role in enhancing usability in a situation in which faculty members are constrained by lack of access to making larger changes.

Realistically, educational contexts provide many constraints that limit the potential effectiveness and usability in online courses. However, it is the responsibility of faculty member to work within those constraints and to advocate for better situations whenever possible.

6. EXAMPLES FROM RECENT EXPERIENCES IN DESIGNING USABLE AND PEDAGOGICALLY SOUND COURSES

Many of these principles came into play as I worked on designing new online courses, transforming existing courses into online versions. I was aware that many of the pedagogical principles for face-to-face education might apply to an online situation, but that several would not. Space limitations prevent me from providing an extensive list, but the examples below may inspire similar activity from other faculty members within their contexts.

In designing courses to be pedagogically sound and to provide as usable an interface as possible, I considered several usability and pedagogical principles and practices, including:

Simplicity: I understood that students in an online course would need a great deal of deliberate simplicity in the content and the wording, consistent with Mehlenbacher, *et al's* advice. Within the Canvas LMS, I made wording as simple and direct as possible. I aimed not to have a chatty style. In addition, I tried to make each assignment step begin with a verb so that students would know what they needed to do to complete an assignment.

In addition, Canvas provides many tools that faculty members might use in courses, but I included only the most essential tools in the navigation bar and hid less common tools from students in order not to overwhelm them with too much information. Canvas also provides a Modules tool that allows a faculty member to put assignments, discussions, quizzes, resources, etc. in one place in sequential order, so I used that tool to help students work through steps in order. Even though incorporating various assignments and activities into one module was more work for me, it reduced the number of places that students would have to visit, thus providing greater simplicity.

Providing a sound communication-creation process: Consistent with a process-based approach to teaching technical communication, I designed course modules so that a series of planning steps allowed students to make decisions about a major project throughout a carefully-thought-out process. Steps also provided students with opportunities to receive feedback from me and from classmates so that they could adjust the directions of final deliverables.

Teaching communication processes in face-to-face technical communication courses may be common, but in an online course, multiple steps appearing in the interface of the LMS may overwhelm students or give them the impression that there is a lot of "busy work" in the course. As much as possible, I tried to provide a rationale for the steps and to streamline them to meet pedagogical goals and usability goals simultaneously.

Help and documentation: Consistent with Nielsen's principle that users should have useful help and documentation, I considered that students new to an online course need orientation to the LMS interface and to the course principles. (I recently conversed with a faculty member who thought his students were "stupid" for not figuring out how where to find course materials, but he had not provided any orientation to them.) Even if students have used the

LMS in a previous course, the way I use it might differ from their previous experiences. To address that issue, at the start of the course I provide time for students to complete activities that will help them become familiar with the course objectives and the LMS interface. Fortunately, Canvas provides several good tutorials about using Canvas, so I was able to point may students towards those resources.

Even with an orientation at the start of a course, it may still be necessary to provide ongoing orientation and even more explicit wording. For instance, at the start of each module, I provide an item titled "Overview of Module X" that explains the module. This item is followed by relevant items that guide students' learning activities. About halfway through a recent course, I learned that students had not read the overview and did not understand the assignment as they were completing the steps. One student reported, "I didn't know we had to read the overview." Hence, I now begin the title of that item with a verb, "Read the overview of Module X," in order to encourage students to read each overview before completing the steps.

Using direct and indirect means for assessing usability: Although I have not yet been able to conduct direct usability testing of the online courses I've designed, I've been able to use several other indirect and direct means to assess the usability of the courses.

I have participated in the Quality Matters training to learn about general principles for effective online courses and have applied those principles to several of my courses. For instance, QM rubric item 7.1 states "The course instructions articulate or link to a clear description of the technical support offered and how to obtain it," so I have included such information in my course syllabus and other relevant materials for the benefit of students who may need that technical support in order to complete the course successfully. I've also applied other general principles of effective pedagogy and effective usability to make the course as usable as possible within my current circumstances.

The most effective direct means I have been able to employ comes from student feedback about the design of the course. For instance, in a course that I offered a year ago, the students commented that a reading quiz on each textbook chapter in an online course was too much, given the other work they needed to complete for the course. I modified the course the next time it was offered to include fewer quizzes but to include several chapters in each quiz. This approach seemed to be more manageable for students.

I anticipate using additional indirect and direct means to assess the pedagogy and usability of my online courses as appropriate resources become available within my context.

7. CONCLUSION

In creating a usable online course, faculty members design interfaces for both novices and experienced users. In this design, faculty members cannot rely solely on intuition but should employ heuristics and more direct measures to assess course usability.

In using multiple approaches, technical communication faculty member should consider that

> we should not rely on isolated evaluations, and … expert reviews are not yet a substitute for end-user testing. Actually, those are complementary approaches. Users are oriented toward tasks accomplishment and subjective look and feel of the system design, and hence the results achieved through user testing are appropriate for identification of general usability problems. On the other hand, experts go deeply into the structure trying to identify problems that influence system functions. Therefore, inspection provides a more precise detection of usability setbacks and at the same time offers suggestions for possible solutions [2, p. 120].

When using multiple approaches within organizational contexts, technical communication faculty members should keep in mind the value of both heuristic analysis and direct approaches because "a usable e-learning system is not just a resource with a nice 'look & feel', but an application that communicates content and structures the interaction in a way that facilitates the learning experience" [2, p. 119].

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