Engaging With Online Design: Undergraduate User-Participants and the Practice-Level Struggles of Usability Learning

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ABSTRACT
As usability research and user-centered design become more prevalent areas of study within technical and professional communication (TPC), it has become important to examine the best practices in designing courses and programs that help students better understand these concepts. This article reports on a case study about how usability research and user-centered design were introduced to TPC students. The article examines how students responded to and articulated new concepts and looks forward to ways TPC programs can develop comprehensive curricula that introduces students to these topics.

Categories and Subject Descriptors
H5.3.Group and organization interfaces: Computer-supported cooperative work

General Terms
Human Factors; Design

Keywords
usability, user-centered design, pedagogy, technical and professional communication

INTRODUCTION
This article discusses designing undergraduate courses in a technical communication program (whether major, minor, or certificate) that encourage students to become practitioners of usability testing by offering them two-part experiences in testing: students act as usability testers and students then textually reflect on those testing experiences, thereby cementing their learning. Many of the field's approaches to teaching usability fall short of including "practice-level" testing experiences. However, we, along with other scholars in the field (see Chong, 2016), suggest that students in technical and professional communication (TPC) programs need to be given opportunities to participate in authentic testing situations with real impact and consequences.

The study we present in this article traces the implementation of usability testing within undergraduate courses in a technical communication program, offering readers suggestions for similar curricular design and overall program modification to allow a prominent place for usability-testing education and practice in lower- (and, by extension, upper-) level TPC courses. In this article, we articulate practical approaches to challenges that arise when creating usability testing experiences that utilize undergraduate students as testers of a campus-wide Learning Management System (LMS).

Specifically, we present data from a semester-long study in which undergraduate students in the technical communication program at the University of New Mexico participated in usability testing of online courses of our multi-major, sophomore-level technical writing course.* The "users," the students performing the testing, reviewed sample courses designed by our online teachers of professional writing and provided feedback on course design, which the instructors later considered when revising and improving their courses.

Throughout the sections that follow, we offer a theoretical basis for our study rooted in emerging research on usability and technical communication professionalization. We also analyze the data we collected in the student memos to assess how well students engaged

theories in usability testing and user-centered design. We then provide practical advice and tangible approaches for instructors and administrators of technical communication programs who seek to incorporate usability testing into their undergraduate curricula. Finally, we forecast future avenues of research that can help TPC research build a more robust approach to usability pedagogy. Our experiences discussed in this article can offer insight into how to design technical communication courses--and on a broader level, entire programs--that fully integrate authentic usability testing that will immerse future technical communicators in successful practices of the field.

USABILITY AND USER-CENTERED DESIGN IN TECHNICAL COMMUNICATION CURRICULA**

Our curricular move to involve usability testing theory and practice in our undergraduate TPC courses in an *immersive* way, with students operating in an agentic fashion as practitioners, resonates with calls in recent scholarship for such change. In her 2016 article, Chong argues that pedagogical challenges in teaching usability are also "practice-level" challenges (to use Scott's 2008 term). Chong calls upon teachers to "[foster] more realistic expectations and understanding about what actually occur in usability projects" in an effort to "better equip our students to not only be advocates for but also the practitioners of a user-centered approach" (p. 23). Among the practice-level challenges are issues such as "developing flexible intelligence" in creating situated methods for particular usability projects, and how to deal with challenges that arise when conducting usability research.

Chong's call to more closely examine and address the pedagogical challenges of teaching usability testing is borne out of her observations of how usability is taught in classes that explicitly describe usability as a component of the coursework through course descriptions and course names. Combining her survey of courses with an examination of available course materials in the field, she notes that technical communication teachers seem to be engaging usability to a "meager degree." In the absence of courses that work to explicitly engage usability and user-centered composition, Chong's observations should not only urge teachers and scholars to develop these courses, but should also serve to inspire ways of engaging these topics at all levels of technical and professional writing programs.

Teachers have worked to develop usability as an important component of teaching technical communication, but several have seen challenges in trying to offer students an authentic usability research experience. Summers and Watt (2015) describe their own efforts in having students design and test a mobile application in a "service" technical communication course (what Kain & Wardle, 2005, call a "multi-major" technical communications course). One of the challenges Summers and Watt observed was that "Usability projects in their entirety, as taught in courses devoted to the subject and practiced in professional usability testing labs, stretch across many weeks or months, a timeframe that is not workable in 'service'" courses. Zhou (2014) likewise notices that teachers are too often adding usability to the end of a project's lifecycle, depriving technical communication students of the opportunity to see usability as it is connected to its precursor, user-centered design.

Zhou's ambition for the possible inclusion of usability in the technical communication curriculum is not new. Scholars have long called for usability and user-centered design to be part of the technical communication curriculum. In her 1989 article, Sullivan observes that usability can become a new way for designers to think about users: "If the learning about users becomes a habit that shapes writing, a cumulative study that informs future writing, then every usability test can contribute to that writer's knowledge of users. It becomes a way of building a concrete theory of audience" (p. 262-263). More recently, many scholars (Kastman Breuch, Zachry, & Spinuzzi, 2001; Miller-Cochran & Rodrigo, 2009; Alexander, 2013) have offered practices and theories for ways to integrate usability and user-centered design into technical communication curricula. Likewise, Meloncon and Henschel's (2013) study of undergraduate technical and professional communications programs found increasing emphasis on requiring students to take courses on usability methods as a part of completing a degree. Of course, the move towards usability and user-centered design has not been without its challenges.

The challenges that Zhou and that Kain and Wardle notice represent the struggle instructors have had in figuring out how best to incorporate usability and user-centered design into technical communication courses. In our study, we align with Johnson et al.'s (2007) call to incorporate usability and user-centered research into all aspects of our technical and professional writing program. The study we present is situated within a larger context, which is the revision of our TPC curriculum. Succinctly, this working programmatic revision strives to strategically combine industry-informed student learning outcomes with activities and assignments at all levels of our curriculum that aim to address the many valences that integrate usability and user-centered composing.

We are guided by the interests of scholars including Zhou and Kain and Wardle, as well as Redish, to redesign our TPC curriculum in such a way that it retains the necessary flexibility and capacity to reflect the constant state of change that shifts the definition of what "technical communication" actually *is*. As Redish notes in a recent interview, teaching "traditional" technical communication is perhaps outmoded: "Of course, a lot of people still make their careers writing documentation, online help, and other materials for software and hardware [...] The most important point to teach your students, from my point of view, is how to think about purposes, users, clear writing, and good information design" (Oswal, 2015, p. 79-80). This claim foregrounds the emergent necessity to *lead with* a pedagogy attuned to information design and usability, which is our program's goal and informs the research discussed in this article.

For the particular course we discuss at length later in this text, ENGL 290 ("Introduction to Professional Writing"), we employed a strategy informed by research supporting service-learning courses (SL) and modules as having a unique capacity to instantiate the practice-level struggles of the TPC workplace. Scott (2008) locates his exploration of practice-level struggles in the context of an SL multi-major introductory course, wherein students participated in experiential learning opportunities, worked in groups, and developed projects for local non-profit organizations. As Scott and others (Youngblood & Mackiewicz, 2013; Cook, 2014; Jones, Moore, & Walton, 2016) have noted regarding the benefits of service learning, students must navigate relationships within the organizations they serve and amongst each other and, in the course of those interactions, develop an awareness of the

sort of practice-level struggles that textbooks cannot prepare them for. Our adaptation of this SL scheme is to insert "service" into an introductory course, our ENGL 290 (the entry course to our minor), which acquaints students with professional expectations and practices. While we are presently not able to incorporate an SL component to the 290 course, we still had hopes that we could borrow ideas from Scott's work to make the work of usability more tangible to our students, such that usability overarched the layered literacies, à la Cook, students were developing. To that end, we worked to set up a unit that would offer students a practice-level experience with usability, even though we could not make the practice immersed in a completely professional exigency.

INVESTIGATING USABILITY AT THE PRACTICE-LEVEL

One of our approaches, which is the primary emphasis of this article, was to investigate ways that we can help students better understand the dynamics between users and designers. In this course, the first course newly declared students in our TPC minor and certificate program take as a part of the curriculum, students are introduced to the wide breadth of what technical and professional writing is. An important component of students better understanding some of the theoretical definitions of the field is the "practice-level" understanding of who they are in the dynamic network of composer and audience that usability testing and user-centered composing make us more cognizant of. To this end, in the early part of our curriculum, we place a special emphasis on getting students to think of themselves not just as users, but as critical users of technical documents and electronic interfaces.

As program administrators and faculty, we were committed to building in a declared "usability testing" foundation to our ENGL 290 "Introduction to Professional Writing" course. Our experience installing this foundation has been instructive to us, as the students' reflective and recommendation memoranda completed at the end of the usability-testing module (writing assignments that serve as our data, which we will discuss in full later in this article) present a series of questions to us as the curriculum designers, the usability-testing administrators, and the course instructors. The students' responses have caused us to consider whether we achieved authenticity in our usability testing module, a specific sequence of weeks in which students studied usability testing theory and learned about approaches and technologies to enact testing. We wondered whether our students' immersion as a collective studying and experiencing testing as a foundational logic of soundly designed user-centered communication indeed resonates with the realities of today's technical communication workplaces. One of the principal goals of the course is to prepare students to enter these sorts of workplaces through the development of new skills, interfacing with "clients," learning workplace practices, and gaining new "literacies." Our goals concerning the authenticity of the student data and our overarching goal of workplace preparation informed our research questions, as stated earlier.

As we discuss later, our study design--in which we engaged students in an authentic usability testing protocol and asked them to both reflect on the experience and the practice-level issues that arise from the tests and make user-centered recommendations based on their experience--intended to place our research questions at the forefront. In the sections that follow, we describe our effort to incorporate authentic usability testing into our undergraduate introductory technical communication course, illustrating students' learning of concepts as evidenced by their recommendation and reflection memos.

Designing the Undergraduate Course

At our institution, we are currently engaged in curriculum-wide reassessment concerning our TPC offerings and, in this context, we are striving to determine how much usability theory is appropriate for each level of our curriculum. Our second-year students tend to not engage usability testing in the same way our graduate students do, and across this spectrum of exposure, then, we are tasked with creating a scaffolding schema that helps students build upon their skills and theoretical knowledge. Ideally, such scaffolding will help students progressing through our UG program to constructively work through the sorts of challenges Chong identifies. As program designers, we also aim to heed Zhou's call for a more *integrated* approach to usability that foregrounds user-centered design across a curriculum.

Our work in incorporating usability research into the introductory course in our UG minor began with our examination of the course design of our online multi-major, sophomore-level technical communication course (called eTC, electronic Technical Communication), ENGL 219. The authors of this article--the administrator of our university's usability lab, the administrator of our online program, and the administrator of our multi-major technical communication program--agreed that we would use the course websites of several of our online ENGL 219 courses and test them for usability in an effort to improve our online teacher-training practices while also improving our undergraduate technical communication curriculum. While our online instructors are required to use to our university-wide Learning Management System (LMS), Blackboard/Learn, to design their courses, our instructors have some freedom to make design changes to a generic shell that has been developed by the program administrators. These design changes include changing information as it appears on a sidebar or moving modules around in the central display of the course website. Instructors have some limited ability to adjust the layout and presentation of the content within the LMS template. Currently, our online teacher-training process at the University of New Mexico includes teaching instructors the effective practices behind course design, as well as the supporting theory, after which instructors design their own courses within our program's parameters (i.e., while the instructors have to design courses to meet the program's learning outcomes, the actual course design is their own).

This design freedom sets up a new exigency that we wanted to explore further: what are the best practices in this limited sort of freedom to design? Even though instructors are required to use the same LMS to design their classes, they each made substantial changes to how content was made accessible to students. Content that would be in a sidebar on one course webpage would be in the center on another, or it would be located in a folder that required some student-users to perform some sleuthing to figure out where the information they sought was located. We wondered, who better to test how well these various LMS-based course versions work than student-users? Following this, we knew that our usability laboratory would allow us to provide an excellent opportunity to test these courses and to then, as a result, train our instructors in the effective practices of online course design for our particular situations. However, we were then faced with the challenge of specific logistics. Yes, student-participants would be a valuable cohort, but which students could benefit our programmatic objectives of improving online course design and which students *could we serve* by involving them in testing?

The administrator of our multi-major technical communication program was also teaching a course that operates as an introduction to our program's undergraduate certificate and minor in technical and professional communication. This was the chosen population of students. The word "introduction," while appearing as a part of the title in the university catalog for the course, is a slight misnomer, as it is not set up to be a prerequisite for other courses. To that end, 52% of the students who took the course reported taking a multi-major technical writing course (the sort of course described in Kain & Wardle, 2005 and Read & Michaud, 2015) either at our institution or another either prior to or during their enrollment in the "Introduction" course. In other words, the students enrolled in this specific "introductory" course may have had exposure to a unit with cursory investigation into user-centered design and usability testing within a typical multi-major technical writing course and were thus well poised to offer feedback on such course design.

While the multi-major technical writing course (ENGL 219) is designed to introduce students to common genres and writing approaches in technical and professional communication (i.e., instruction sets, proposals, memos, and feasibility reports, to name a few), the "Introduction" course (ENGL 290) focuses on practical and theoretical challenges that are pertinent to individuals thinking about entering the technical and professional communications workforce. The "Introduction" course, unlike the multi-major technical writing course, includes invited speakers from industry who speak specifically about how technical communicators become acculturated to the field. Students explore the working lives of technical and professional communicators in the context of preparing themselves to take courses in our certificate or minor programs. So, these ENGL 290 students seemed appropriate for selection because we believed the usability testing experience would be beneficial to the larger objectives of the course and, thus, to the students' learning. Moreover, we believed that these students could write with a greater awareness about how usability and user-centered design fit into the discipline of technical and professional writing because of the 290 course's specific focus on professional practices of technical communicators. We further postulated that these students would be most acutely aware of the sorts of practice-level struggles that we hoped would help them develop the sort of "flexible intelligence" Chong calls for that would make them better able to adapt to the sorts of challenges technical and professional writers often face.

The ENGL 290 course included a unit dedicated specifically to user-centered design and usability which preceded students participating in the usability test itself. Before the unit, students completed an instructions/procedures assignment that required mindfulness of users' potential experiences with their process descriptions. Students performed group work analyzing existing multimodal instructions sets online. All of this worked to build their foundational knowledge. Once they were immersed in the usability and user-centered design unit, students read a chapter from Markel's *Technical Communication*, 11th ed. about usability testing and discussed the topic extensively in class-time; these discussions were supplemented by in-person and video guest lectures by usability and user-centered design practitioners. Over these weeks, these activities deepen and added nuance to their understanding of user-centered design and usability testing.

What resulted for us was a convenient alignment of several programmatic objectives: we wanted to test user-centered design principles to develop best practices in design for our online classes, and we had a group of introductory students who could both learn about online design and usability testing as a component of their initial acculturation to the field of technical and professional writing. The study relied upon data collected from the introductory students' reflections and observations about the usability testing process. This study examines their acculturation to thinking about user-centered design principles as they embark on the first steps of their future careers as technical and professional writers.

METHODS

Our research questions were forecasted earlier, but to reiterate, they are

- Question 1: How can TPC educators design course components that enact authentic user-testing experiences?
- Question 2: How can educators ensure that student-participants engage with the practice-level struggles associated with usability and user-experience design?

While courses focusing on usability and UCD exist throughout TPC programs, we see that such courses are often upper-division offerings. If we were going to compose a curriculum that connects the professional practices of usability and UCD to a student's entire career, we felt we needed to examine how our introductory courses engaged these topics. To this end, we selected an introductory-level course, "Introduction to Professional Writing," as our site of investigation for our study. If we could better understand how engaging professional practices in usability and UCD could operate here, we felt we could better offer a more comprehensive approach throughout our entire program.

We chose to make student writing about the usability-testing activity a centerpiece of our study. Drawing from Blakeslee's (2001) work studying how students learn about professional genres, we decided to use the student writing as a locus of study. Considering the context of our study, and the relatively low sample size, we knew that we would be putting forth a case study, much like Blakeslee. While Blakeslee researched the way students become acculturated to professional practices in genre, we knew we could not offer the same opportunity with respect to usability.

Our research questions less about acculturating students to professional practices than they are interested in *introducing* students to the complexities of usability and user-centered design concepts. Still, we felt the case study approach utilized offers a workable methodology to collect and analyze data that shed light on what students may learn from the sort of usability teaching model we developed. Our approach to asking students to provide insights in established professional genres as part of their required coursework, and to use this material as data in our study, is a tactic with precedence (such as in Newmark & Ford, 2012); our formative assessment approach is based on Blakeslee's (2001) approach of studying students' responses to activities that strived to "bridge" their classroom outputs to workplaces scenarios.

In brief, students in the "Introduction to Professional Writing" course participated in the aforementioned usability testing in the position of users of an online multi-major technical writing course. The student-participants provided testing data through their recorded interactions with the sites through Morae and by filling out a short pre-test demographic questionnaires and a post-test questionnaire that included a Standard Usability Scale. The student-participants also composed two memoranda to be turned

in for credit in the course. These memoranda are the primary focus of the study presented here, as they provided insight into students' usability experiences.

The first memorandum, which we call the "Recommendation Memorandum," was addressed to the instructors who designed the course website. In this memorandum, student-participants described their impressions of the site they tested and offered specific recommendations for enhancing the design and user experience with the page. To this end, we asked student-participants to draw upon their growing expertise in user-centered design to compose their memos. In this context, they operated in a space that is slightly more informed about user-centered design than the "typical" user, while still interacting with the site in a way similar to many undergraduate students. The second memorandum, which we call the "Reflective Memorandum," was addressed to the individual who moderated the usability test (one of the authors of this article) and directly considered the usability testing experience. This memorandum asked the student-participants to reflect more intently on the research component of the usability test. (We have included the prompts for both of these assignments in Appendix 1 and Appendix 2 at the end of this article.)

Each of these assignments was meant to shed some light on our questions, presented earlier. These questions drive not only this study, but our curricular assessment. As our results show, we gained considerable knowledge about best practices of designing course components that enact authentic user-testing experiences (our earlier-stated Question 1) and about facilitating student-participants engagement with the practice-level struggles associated with usability and user-experience design (our earlier-stated Question 2).

Data Collection

We sought qualitative data from students in the form of student writing from the two aforementioned memoranda. In particular, we wanted to see if students demonstrated metadiscursive moves that demonstrated that they were generally understanding concepts related to usability, UCD, and the professional practices of TPC generally. While research methods including interviews, surveys, or focus groups could have perhaps offered similar insight into answering our research questions, we felt that the way we had students situating their writing (that is, to specific audiences who act as stakeholders in the work they evaluated) would elicit more thorough and reflective writing, writing that itself served a course-specific goals and helps students in the course to fulfill a specific, lasting objective. Simply put, we felt the inclusion of a "real" audience for each memo would allow the students a more authentic scenario and would, thereby, elicit more usable substance in their writing -- usable to the course designers whose courses they tested, faculty-level readers striving to modify curricula, and to us as researchers.

The data we collected via the student insights delivered in the recommendations memoranda address Question 1, as the prompt for the Recommendation Memorandum asked students to think of themselves as offering user-centered advice to the LMS designers in an effort to enhance the usability of the site, based on their experiences in the usability test. As we read through these memoranda, we were most interested in how students connected their conceptualization of "users" to themselves. We looked closely for places where they discussed the user from a designer-perspective, and examined their texts for instances when they moved beyond being student-participant and into the role of designer-consultant to make pointed suggestions about how the LMS course designer could improve the user-experience of the website.

The second question was engaged by the students' Reflective Memoranda, which prompted our participants to think and write about specific challenging parts of the usability testing experience, and the challenges posed by user-centered design. While the Recommendation Memorandum was written for course designers, the Reflective Memorandum was addressed to the moderator of the usability test and was meant to allow a space for our participants to speak back to the protocol so they could raise concerns and criticisms to an audience that could make adjustments to the protocol based on their reflections. We examined these texts for instances in which we could identify a clear move toward what Chong (2016) calls "flexible intelligence." We sought moments when student-participants identified difficulty and incongruity in what they experienced and how that could challenge them as designers themselves.

While the student-participants did not have a working knowledge about the design constraints of the LMS itself, we believed they could recognize the ways in which user-design decisions can be tricky, especially when faced with design in online spaces. For this reason, the question in their assignment prompt concerning "How the usability testing experience prepared you to enter a professional community of 21st-century communicators?" is where we focused our analytical attention, as we believed that in answering this question, the student-participants would have to think about the experience holistically, about what it was like to be a user and how usability testing and user-centered design can contribute to their own career development in TPC.

In both documents, the students were given real audiences. Later, their texts were passed along to those audiences. The writing is "authentically" professional in that our student-participants had the experience of writing for an audience that could take action based on their texts, something that some of these students may never have experienced in a class before. Still, we wanted to make sure that the student-participants would be able to make use of the writing for their own burgeoning careers as technical and professional writers by getting them to start thinking, and writing, about the practice-level struggles technical and professional communicators face regularly.

We collected the student-composed texts as assignments through the course LMS. The student work was evaluated separately from being passed along to the creators of the LMSs they tested (for the Recommendation Memoranda) and the administrator of the usability tests (for the Reflective Memoranda). With this setup, we were able to capture all of the memoranda that were turned in for evaluation. The instructor of the "Introduction to Professional Writing" course collected these documents and kept them secured until the course was over and grades had been turned in, at which point the other investigators for this study and LMS creators received access to the documents. In addition, we asked student-participants to complete a pre-test questionnaire so we could collect some general demographic information and get a sense of their prior experiences with online courses and LMSs generally.

Of the 17 students in the course, all participated in the pre-test questionnaire and from that number, 16 released their work to be shared as a part of this study. Due to the double-blind nature of how we separately collected the questionnaires and the written

assignments, we could not isolate out the demographic information from the memoranda. We believe the sample is generally representative of our students and did not show substantial outliers from that group and therefore we are not concerned that the loss of a few students in the study materially change our findings in this study. This sample size (n=16) is not large enough to offer a generalizable result for each LMS (as we tested 5 LMSs, each LMS creator received about 3 recommendations reports), we still believe that the recommendations were useful for LMS creators to make useful changes to enhance the usability and UCD of their sites. For our purposes as program administrators, we believe the sample size was generally representative of our students, and would offer responses that we could use to further develop our program. At the time of the testing, our minor and certificate were still nascent, so the course itself contained about 25% of our minor and certificate students.

Coding

In an effort to find places where students engaged and reflected upon the practice-level challenges of usability testing, we examined both of the required memoranda for examples of moments when students made a qualitative statement about the practice-level challenges of usability testing or user-centered design. For us, this kind of "qualitative statement" would be one in which students recommend some course of action that may or may not be feasible in the LMS they tested. A statement such as this would qualify as "flexible intelligence" because the participants were faced with practical impediment and therefore limitations of theory. A Reflective Memorandum that considers the ways in which some recommended course of action may not be feasible in the LMS apparatus seems to us to be a nod toward the development of "flexible intelligence" where theories about user-centered design are difficult or impossible to actually implement. We were particularly interested to see if student-participants went further in recognizing the incongruence of theory versus practice to come up with novel approaches to figure their way out of these issues. To best code and articulate these areas, we turned to the "layered literacies" put forth by Cook (2002).

We found Cook's discussion of rhetorical (p. 10) and technological (p. 13) literacies as particularly germane to what we hoped to understand about how students engaged in our activity. For instance, we were interested in observing how students conceptualized "users" in the context of their a priori understanding of "audience." In usability testing, users play a key role in shaping effective interfaces, similar to how Cook describes components of rhetorical literacy (p. 10). Similarly, a matter of understanding the "flexible intelligence" and practice-level challenges of usability testing seemed to us to align closely with technological literacy. In particular, we were eager to see how students developed "a working knowledge of technologies that help technical communicators to produce communications, documents, or products." Moreover, we wondered how our students cultivated "an ability research how users work with technologies" (p. 13). All of these characteristics that Cook described became the key units of analysis for our coding and analysis.

Much like the usability tests themselves, our research in this project is formative. Knowing that a case-study cannot offer generalizable data, our approach to coding was borne of our conversations about what we sought from the activity pedagogically. Our conversations focused on earlier-mentioned values, as well as understanding how the usability and user-centered design activity impacted how students understood "users." As we will describe later, this project was very much part of a work-in-progress for developing our program. The coding was handled by one member of the research team, and then discussed with the other members later. Each of these discussions about coding and analysis made our discussion more focused and robust. In a sense, our inter-rater reliability was a result of our constant discussions and reading of the memoranda. The formative nature of the study, both in the usability testing and our research design, granted us the ability to discuss larger topics pertaining to how we envision our TPC program going forward. What is presented in our results section are the student-participants' own words as they discuss their first forays into usability testing and user-centered design.

Participants

In our study, our total number of student participants from the ENGL 290, "Introduction to Professional Writing," class was 19; these students participated in the usability tests and composed both the Recommendation Memorandum and the Reflection Memorandum. The participants represented the general population that typically enrolls in the multi-major technical writing course. From our pre-test demographic questionnaire, we learned that 79% of the participants were either sophomores or juniors, who are generally the largest group who enroll in the course. 53% of our participants reported having taken a multi-major technical writing course either on our campus or at another university. Of the participants who had taken a multi-major technical writing course before, 6 (32%) had taken it as an online course. This means that more than two-thirds of the participants had never taken an online multi-major technical writing course. Thus, for the majority of the participants, the experience of going through our test, designed to assess the usability of an online technical writing course, was novel. We did not expect their prior knowledge of these courses to interfere with their ability to offer productive feedback for the instructors.

The participants were generally familiar with the Blackboard/Learn Learning Management System. All of the participants reported having used Blackboard/Learn before. The prevalence of the LMS on our campus is almost ubiquitous, as 12 (63%) of the participants reported having taken 13 or more college-level courses that used Blackboard/Learn as a course tool. This meant that the participants were generally practiced users of the LMS. Indeed, to this end, students' background with the LMS would allow them to focus on the design decisions of the instructors rather than the usability of the LMS itself. In using the LMS so much and through a variety of courses across disciplines, our cohort of student-participants had likely been exposed to a diverse cross-section of instructional design in the LEARN LMS and a variety of degrees of usability. Indeed, this demographic information prompted us to wonder if the participants would draw upon their prior user experience with the LMS to make recommendations or reflections through that lens.

We also think it is important to note that the students who tested the site are a variant of the target audience for the site they tested. As participants in our study, students became participants in LMS design. In writing focused memoranda about the usability testing experience, they gave the sort of feedback to course designers that is invaluable. Recent research in participant-based research (Ryan & Potts, 2015) has helped theorize a robust approach to rethinking "users" and "usability." The insight by Ryan & Potts is part of the reason we tend to reference our student testers as "participants" in this article. Since about half of our participants had not taken the multimajor technical writing course before, they had the

opportunity to help test the course before they took it for credit. While this was not the case with all of our participants, we knew this sort of research could help enhance the experience of students who would soon take the course. To this end, the student responses to the sites and the testing demonstrated an interesting and useful unit of research.

The participants, while new to the field of technical and professional communications, were not neophytes to usability testing and user-centered design. Part of the curriculum within the "Introduction to Technical and Professional Communication" course was a unit on usability. As a part of this unit, the moderator of the usability tests visited the class before the testing commenced to explain some general information about the procedure of the test. He also discussed the ways in which usability and user-centered design are operationalized for writers in industry. Student-participants had an opportunity (and used it) to ask questions and get clarification about both the testing protocol in particular, and the topic of usability more generally before they participated in their own tests.

In our discussion of this IRB-approved study included in the following sections, we have changed all of the students' names to pseudonyms to honor their anonymity.

RESULTS AND DISCUSSION

While both documents created by the student-participants are full of fascinating articulations about user-centered design and usability testing, here we highlight themes that continued to emerge from the tests that we believe are the most relevant to responding to our research questions. To this end, these findings are not exhaustive, but are representative of recurring ideas that we believe are important for teachers of usability and user-centered design to consider as they further develop their own curricula.

Recommendation Memoranda

In crafting the Recommendation Memoranda, some student-participants used prior experiences with the LMS to make recommendations to the designers of the test LMSs. Again, the context for students' writing of their Recommendation Memoranda was that they were providing the online course designers (who were unknown to them) specific feedback on the usability of their course shells, as determined by the student-participants' engagement with these shells in their 30-minute test. Student-participants were instructed by the testing moderator to engage with the shell as if it were the student's first day in the class as a student, trying to determine how to use the Blackboard/Learn site and trying to access the necessary course documents and locate other getting-started types of materials. Because, as indicated earlier, many of the student-participants had prior experience with courses in Blackboard/Learn, students frequently referred to examples from other courses in their recommendation memo remarks. For instance, one student, pseudonymously referred to as Catherine here, wrote,

> For YouTube videos, I have seen chemistry labs embed YouTube videos in Learn. They did not always work, so hyperlinking the links to videos would work best. At a minimum, taking the time to hyperlink the links will encourage students to watch the videos and feel more comfortable with the Learn environment.

Interestingly, very few of the participants (only 19%) made an explicit reference to "users," instead preferring to use the Recommendations Memorandum to speak specifically about their own experience performing the test. This is particularly interesting considering that students are writing in a context where these reports will be read by the course designer whose LMS page the student-participants tested. One of the times when a participant, Anne, started to discuss "users," she reverts back to articulating her thoughts about the test through her own experience, thus making recommendations to the course designer based on her user experience of other, prior, courses in Blackboard/Learn and prior experience using multimodal tools, such as links to video, online:

> When addressing the insights I found from my testing experience, I came across several areas that could be improved to help the user feel more comfortable and at ease when using the site. For starters, although links were provided for the instructional videos, the hyperlinks were not activated and therefore I was unaware on how to view the video until [the moderator] told me to copy and paste the link into another tab to view the video.

Shannon contextualized the user-student identity in her recommendations explicitly, positioning her experience as speaking for what other students would also likely experience:

> Though the flaws of this site were minor, making some simple changes to eliminate them would improve students' experience with the course. Students will likely complete the list if the order of appearance is more intuitive to what's necessary for completion of the current task.

However, a vast majority of students (75%) did the work of contextualizing the user as fellow students, thus using the term "student" to replace "user," such as in Jane's recommendation:

> As I completed my brief usability test, I had very few problems and any that I did encounter were very minor. However, by improving on these issues, students will be best equipped with the tools needed to succeed in the course.

Four students (25% of the participants) went further to think about how they would made adjustments to the site if it were their design. Evelyn places herself in the designers' seat as she offers her suggestions for making the site more user-centered:

> In the navigation pane, I would add in all the weeks of work. Perhaps with the titles "Week (insert week number here)", plus having the 'grades' tab, syllabus tab, contact tab, course information tab, messages tab, and discussion board tab. Since I could not specifically remember what was there in complete certainty, I may have duplicated some titles with what was already there.

Although the course instruction (including lectures and readings), placed an emphasis on *user*-centered design and the role of the *user* in the workflow of a technical document, the preferred nomenclature of our participants showed an affinity for their contextualized use of the LMS or thinking about themselves as designers. It might be interesting to perform this study again using an online interface that is not so clearly connected with schoolwork. Indeed, the practice of having student-participants evaluate an online LMS for a class and inside a school building likely helps reinforce the idea that they are behaving more as students than users, or that they see the two terms as interchangeable in this context. We discuss this idea further in our "Challenges and Lessons Learned" section.

Reflective Memoranda

The Reflective Memoranda were addressed to the moderator of the usability test (an author of this study). Students interacted with this individual during a previously held in-class session on usability testing and user-centered design and the next time the students interacted with him was in the usability lab setting. When it came time to write for this usability expert as an audience, students had a decent sense of this individual's level of knowledge and interest in being provided with feedback on the test he had designed. Thus, the Reflective Memoranda addressed to him show candor as well as students' efforts to demonstrate document and structural clarity, so that their feedback would be easily comprehendible.

One of the most interesting and pertinent responses to our research question about how educators ensure that student-participants engage with the practice-level struggles associated with usability and user-experience design came from how students wrote in answer to the component of the prompt that asks them to discuss "How the usability testing experience prepared you to enter a professional community of 21st-century communicators." Student-participants offered a variety of responses to this prompt. Catalina saw how the process explicates a product's lifecycle more thoroughly:

> However, in participating in this usability test, I have gained an appreciation for how much planning, work, and attention to detail goes into any successful interface or product. This experience has made me feel far more prepared to enter a professional community of 21st century communicators simply because I have become aware of this whole added sublayer of work and skill, which I never realized existed, and about which I know I still have a great deal to learn.

Likewise, Anne connected how the experience not only gave her an idea of how usability testing and user-centered design operate in the context of composing her own work, but also how it has added to her vision of what a technical communicator's work entails:

> ...the whole process, beginning from lectures about the purpose of usability all the way to the final test, definitely helped prepare me to enter a professional community of 21st-Century communicators. Along with learning about the testing process and being exposed to new software that I may encounter later, the overall experience also better prepared me for what to be aware of in my own work. For example, it helped me think about how the format and design of even a simple document will affect how my audience sees, understands, and experiences it.

While Anne's reflection shows growth in acknowledging the role of strong design principles and audience awareness that are important to technical writing success, she, like many of the other student-participants, still struggled to specifically connect to the sorts of "practice-level struggles" we were hoping to see them engage.

Some of the student-participants hinted that engaging with usability testing exposed them to the greater complexity of technical writing. Tamara notes this struggle when she writes that "If the communication is unclear in a document of any kind, the results of the document might not be what you wanted it to be." She goes on to see usability testing as a way to act as a check against unclear communications:

> One way to ensure that the document is clear and direct is to have an unfamiliar third party test the document. This form of usability testing makes sure that the document produces the results you are looking for…. Feedback from the testing shows what could be improved within the document. When I went through this section of learning, I found out how easy it is to miss key features of documents and programs when you are the writer or designer.

While acknowledging the fact that she could now see how a writer or designer is not immune to design missteps, she is also giving what we might call the first inclinations of engaging a "practice-level struggle." Here she acknowledges that the work of designers is not finished when they complete their draft of a document, but that the document benefits from further scrutiny from "unfamiliar third part[ies]."

One of the places where we saw student-participants engage in a debate that challenged their preconceived notions about technical communicating and design was in Elizabeth's reflection:

> For future academic and professional purposes, I've learned that innovation, while potentially beneficial, may not always be the most efficient way of communicating complex information—particularly if there are 2 preconceived expectations for the method of communication.

In discussing "2 preconceived expectations for the method of communication," she acknowledges the diversity of design options at her disposal and her own role in determining which design option is the best choice for her present situation. She draws out the discussion further, mentioning how she was involved with an organization that had several options for adding a button on the website of a campus organization's website to allow visitors to donate money to the organization. She used the experience with the organization to connect to her experience with usability testing by proposing that "[she] would both approach internal testing differently and suggest additional testing by parties unfamiliar with the organization, as a result of this experience." Indeed, this sort of reflection, one that connects some experience outside the classroom to the testing itself is an avenue we would like students to pursue more in the future.

The range of responses we illustrate in this section best represents the varied approaches students took to addressing the prompt for the Reflective Memoranda. The student-participant responses provide fascinating insight into how students can develop their awareness of audience and user-centered design at an early stage in their technical and professional writing education. We believe these responses still offer us much to consider in the context of curricular development of usability research and user-centered design within the technical and professional writing classroom.

Sample Size and Usability Pedagogy

We cannot make a generalizable claim about how students engaged with the exercises due to our small sample size. The sample size was also small enough to fall short of what might be considered robust by usability research standards. We have written previously about the struggle to have a large enough sample size to make meaningful usability research claims (Bartolotta, Bourelle, & Newmark, forthcoming). Ultimately, we viewed our sort of testing as "formative," to use Lewis's (2012) description. That is to say, we saw the work of these usability tests as finding usability problems to be addressed by the designer rather than "summative," that would

call upon a measurement-based evaluation of usability (such as how long it takes for a user to complete a task). In the service of teaching students about usability, and giving teachers some formative usability feedback on their LMSs, we decided to make use with the sample size available to us. Indeed, we hope that small sample sizes from this case study will not frighten off future teachers and researchers from engaging with usability pedagogies. For teacher-designers, we believed that some formative usability testing is better than none. For students, the practice-level opportunity to engage in usability is too rare to be usurped by smaller-than-ideal sample sizes.

CHALLENGES AND LESSONS LEARNED

As this project was a case study, we cannot assume that the responses we received from the student-participants are generalizable across all populations of technical and professional writing classrooms. Nonetheless, the responses we received shed some light on potential challenges teachers may face as they engage undergraduate user-participants with online user-centered design activities. In addressing the questions that drove this study, we observe two overarching challenges that we believe merit further research in usability and user-centered design pedagogies. First, when we wonder how educators can design course components that enact authentic user-testing experiences, we found that students connected more to their identity as students than as users in the usability tests, which poses a challenge in our efforts to create "authentic user-testing experiences." To this end, we believe this sort of classroom activity can be a model of a school-to-work "bridge" that Blakeslee (2001, p. 182) describes in her own research.

Likewise, when we wonder how educators can ensure that student-participants engage with the practice-level struggles (to again invoke Scott's 2008 term) associated with usability and user-experience design, we observe that few students in our test population took the step to extrapolate in their memoranda on this "next step" in their trajectories as technical communicators, the step that would have them enter the "practice," specifically, the professional workforce. As with our findings concerning the first question, we also determined that most students seemed experientially locked into their identities as students, so envisioning the relationship between their classroom-context usability-testing education and experience and future workplace scenarios was hard for them, even when presented with authentic audiences for their writing and industry-replicating testing experiences.

One student's response showed the possibility for students to connect their TPC curriculum experiences with future industry realities. Elizabeth's text came closest to what we would consider engaging with the practice-level struggle referred to by Scott, echoed by Chong, and considered by others, including the authors of this article. Particularly striking about Elizabeth's remarks is how she connects the classroom and usability laboratory experience to a prior design experience she had with a campus organization; she builds the conceptual bridge between scenarios that we believe trains students to envision, and thus create, connections of transfer to future situations in a workplace. While none of the other students wrote about a similar experience, we cannot help but wonder if it might be helpful to have students interrogate prior design experiences through the lens of what they experienced in the usability laboratory.

CONCLUSION

As a formative study, our research gave us valuable data that can move us toward modifying elements of our TPC minor and certificate program, as well as our teacher training approaches to online TPC courses. This research opened up a new discussion about the role of course shells and templates in online courses. We started to wonder how to balance student ease-of-use in set and consistent templates against the freedom of teachers to adjust course design to their own preferences. This is an ongoing conversation in our program and has implications in online writing instruction more generally.

While our participants offered helpful advice to the designers of the LMS course sites they used, we are not entirely confident that our exercise went as far in getting them to critically explore the role of the "user" in usability and user-centered design as we might have liked. One of the reasons for this may have been the hyper-academic design of the research. Our participants naturally have deep ties to their identities as students, and in the context of this testing, that identity appeared to also be a prism through which they understood user-centered design. While in the context of LMSs their gravitation toward thinking of themselves as students makes sense, we cannot know if in another context they would again rely upon this known identity.

The role of "identity" as it changes how one considers herself a "user" seems to be under-studied in research on usability and user-centered design. While we would not advocate introducing Kenneth Burke's discussions of "identification" and "consubstantiality" in an "Introduction to Professional Writing" course, we believe this may be a path worth pursuing for researchers to explore how users identify themselves with the "users" of the materials they are testing. In our case, the role of "user" was consubstantial with that of "student." We also believe that we could see similar issues arise when the traditional use of some material is racialized or gendered. We wonder how this sort of identification changes the behavior of user-tester, and more importantly how this should change how we design pedagogies that introduce usability research and user-centered design to undergraduates.

While our study is limited, it did provide insight into students' reactions to and experiences with usability testing. Based on our study, we are examining making changes to our curriculum and will continue to incorporate the usability testing of online courses, as the testing has many benefits for our program, not only for our online instructors, but, perhaps more importantly, for our undergraduate students who will enter the workforce with foundational skills in technical communication. Indeed, our course design can be helpful and serve as a model for other teachers and administrators who seek to improve existing course and program curricula or design new courses that encourage undergraduate students to learn the concepts of usability testing at a practice level, beyond the theoretical knowledge that is often presented in these types of introductory technical communication courses. We encourage our readers to consider the challenges and lessons learned from our study, designing their own courses based on authentic usability testing experiences and their own course or programmatic outcomes.

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ENDNOTE

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** For the purposes of this article, we focus on the design of the undergraduate technical communication curriculum to increase authentic usability experiences. For more information on the changes we made to online teacher-training, see our 2017 article in Technical Communication Quarterly entitled, "Professional Development for Online Technical Communication Educators: Continuing the Conversation."

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APPENDIX 1: REFLECTIVE MEMORANDUM ASSIGNMENT PROMPT

In this one-page reflective memorandum, please use standard memorandum format to relay information to your audience about your experience as a usability tester.

You will want to be sure your memorandum has the following features and considers the following subjects:

- The physical design of the usability testing schema (Where did you sit? What else was in the room? Tell us about the computer and any other hardware that might be relevant.)
- The instructions you were given for the test.
- Your awareness of or insight into the testing software, Morae (if you were unaware of it, that is fine)
- The time allowed for your teast (30 minutes)
- Your attitude about testing the 219 course via the online Learn platform.
- Your level of comfort with your expected tasks during the test.
- Anything else you think is significant to convey about the testing experience.
- How the usability testing experience prepared you to enter a professional community of 21st-century communicators.

APPENDIX 2: RECOMMENDATION MEMORANDUM ASSIGNMENT PROMPT

In this one- to two-page (single-spaced) recommendation memorandum, you will be offering recommendations based on your usability testing experience of the Learn portal for the e219 course, which is what you tested in the usability lab in Week Eleven. Your audience for this recommendation memo will be the graduate student course designers of the e219 course. Keep that audience always in mind as you are writing.

Your memorandum should have these sections (after the customary memorandum header and purpose statement): 1) Introduction, 2) Methods, 3) Insights Drawn From Testing Experience, 4) Recommendations, and 5) Conclusion. I will sketch below the kinds of content you might want to include in each section.

1. In your Introduction, outline your report's organization. Identify the positive aspects of the course design and the salient problems. Briefly offer an overview of the possible solutions. Give background and contextualization (context includes your own preparation for serving as a tester, drawn from material from other courses or in ENGL 290, and how you participated in the test).
2. In your Methods section, you will provide a very abbreviated consideration of this customary aspect of a Recommendation memorandum. Your "methods" for being able to offer insights into ways a TA could improve an e219 course are drawn from your own testing of it as a usability tester in the lab. Comment briefly on what you did and how in the testing scenario.
3. In the Insights Drawn From Testing Experience section, use the following questions to generate your insights:
    - What was your first impression of the course design?
    - How easy was the course to navigate?
    - What did the instructor do well in terms of design or course layout?
    - Were the tasks you were given easy to follow based on the instructor's course prompts or design?
4. In your Recommendation section, comment on the following items specifically, along with any other material you feel it is important to share with the designer:
    - What would you suggest for improvements for the navigation specifically?
    - What would you recommend the instructor changes about course?
    - What aspects of design might be improved, both in terms of visual elements of the Learn portal, and regarding the design/structure/content of the course?