Blackboard

Project Report

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Table of Contents

1. Introduction

1.1. Purpose

Blackboard is a very commonly used class organization tool that provides ways for students and teachers to interact via discussion boards, quizzes, assignment submissions, grades, and general announcements. Due to the critical position this software is in with regard to academic performance and student-teacher interactions, it is important that the interface be as easy to successfully use as possible. In general, it is important to be able to find, identify, and complete tasks related to coursework. Blackboard itself is not necessarily poorly designed, so the focus of this project is to make minor changes that impact the ease of use of the site rather than to completely redesign Blackboard wholesale.

1.2. Tasks Identified

The tasks specifically being addressed in the project are as follows:

1. Navigate to the description page for this project from the blackboard home page.

2. Find the syllabus for CSE 301 from the blackboard home page.

3. Submit a discussion question for POS 150 (control group users will be asked to stop this task immediately before actually submitting the question.)

1.3. Assumptions

Limitations in my own ability to access the site mean that I must work under the assumption that any users tested fall under the “Student” persona, as I do not have any capacity to access the features limited to “Professor” or “Administrator”. This is unfortunate, but outside of my control.

For the same reason, I am using my own (anonymized) blackboard page to control variable customization and class differences.

2. Analysis

2.1. Personas

2.1.1. Student

NAME: Steven
AGE: 20
ACTIVITIES: Submit assignments, check grades, participate in discussion, retrieve class information.
PAIN POINTS: Inconsistent locations for the above, information buried unnecessarily deep.

2.1.2. Professor

NAME: Sarah
AGE: 45
ACTIVITIES: Create assignments, assign grades, review submissions, customize the class blackboard page.
PAIN POINTS: Students have difficulty finding and completing tasks.

2.1.3. Admin

NAME: Chris
AGE: 60
ACTIVITIES: Assisting with account problems, create accounts, remove accounts.
PAIN POINTS: All problems with other personas.

2.2. Task Analysis Tools

Analysis for this site was done in the form of a heuristic evaluation and a cognitive walk though of each of the three tasks.

2.3. Task #1

2.3.1. Task Detail #1

The user will be started on the Blackboard home page. They will be asked to navigate to the CSE 463 final project description, and find the 4th item “Identify three to five personas of users”.

2.3.2. Task #1 Analysis

This task is straightforward, but the path to finding the final project is unintuitive. Most users would not expect the description of a project or assignment to be listed under “readings”, it would generally be expected to be under “assignments”.

2.3.3. Task #1 Discussion

This task can be improved by standardizing the layouts and locations of individual classes. It is important that while doing so we do not remove all customizability from the class layouts, as this would negatively impact the “Professor” persona’s ability to run their class.

2.4. Task #2

2.4.1. Task Detail #2

The User will be started on the Blackboard home page. They will be asked to find the first course learning outcome in the Syllabus of course CSE 301.

2.4.2. Task #2 Analysis

This task is straightforward as well, with the main flaw being in the user experience of the site. The design for CSE 301 is jarring to say the least, and vastly different from the vast majority of other class designs.

2.4.3. Task #2 Discussion

As with task 1, this can be improved by standardizing the layout of the classes. The goal here is to preserve the individuality of the classes while ensuring there is still a standard layout and look that the user doesn’t perceive as unenjoyable.

2.5. Task #3

2.5.1. Task Detail #3

The User will be started on the Blackboard home page. They will be asked to submit a discussion question with the title “Discussion question relating to CSE 463” and the message “This question is an example of a possible question that may be asked in a discussion” to the discussion board of POS 150.

2.5.2. Task #3 Analysis

This task involves several unintuitive steps, including a confusingly named tab for discussions and a poorly designed forum layout. In addition, the location of this course

tab on the homepage is not intuitive, as a user would generally expect the courses to be ordered by course title rather than by course ID.

2.5.3. Task #3 Discussion

The first problem, the confusing tab names, is solved in the same way as the other two tasks. In addition, the final problem is solved by allowing users to choose which way they would like to sort their classes via a dropdown menu defaulting to sorting by course title.

3. Prototype and Design

3.1. Overview of Prototype and Design Features

The common pain point for all three tasks is the unordered list of courses on the Blackboard home page. As such, that will be ordered alphanumerically by either course title or course number, selectable. In addition, offerings for the individual courses will be standardized. In a full implementation, these offering would be customizable to a degree by Professors, but with a standard basis and guidelines for where various types of content belong.

3.2. Task #1

3.2.1. Task #1 Design

In addition to the change mentioned in 3.1, for this task a standardized implementation of the class page will be created in place of the current one. This is to lower the learning curve of using Blackboard, so that students are not constantly being made to re-learn how to interact with the website every time they enter a new class.

3.2.2. Task #1 Design Justifications

In general, it is poor design to have the steps for a task vary randomly. There needs to be a solid justification for that variance, and “It is a different course” is not enough justification when the end goal of that task is the same regardless of course. It results in a higher number of clicks and backtracking to reach the goal, a longer time to reach it, and user frustration when completing the task.

3.2.3. Task #1 Prototype

For this task, the UI itself was not changed. Instead, the main path a user must take to find the item requested was altered to be more intuitive to a naive user. In fact, the UI for this task was used to model the UI changes for tasks 2 and 3. The alteration here was to move the final project description from the Readings tab to the Assignment tab, which makes intuitive sense to a user that had used blackboard for other classes before and as such would expect and assignment to fall under “Assignments”.

3.2.4. Task #1 Prototype Rational

The rational behind this redesign is to make the navigation more intuitive to users. The advantage to this is that it is less frustrating to the primary users of Blackboard, who fall under the “Student” persona. The disadvantage is that it removes some degree of customizability from the users that fall under the professor persona, but as there are far, far more students than professors I feel this tradeoff is worth while. This prototype meets the goals of the project in that it does not wholesale redesign the

site or the process, instead making minor changes that make it easier for the user to find the item they are looking for.

3.3. Task #2

3.3.1.Task #2 Design

The primary design changes for this task were covered in 3.1. All other steps in this task are relatively well designed. That said, this course's page design will also be replaced with a standardized design for the same reasons mentioned in 3.2.1, i.e. to improve user experience across multiple courses.

3.3.2.Task #2 Design Justifications

Finding an item in a sorted list is generally easy, assuming you know by what criteria the items are being sorted. Finding that same item in an unsorted or apparently unsorted list is significantly more difficult. For these reasons, I emulated a sorting mechanism by which a user can choose to sort by either course identification or course title on the homepage of blackboard.

3.3.3.Task #2 Prototype

For this task, the class UI was changed to match the standardized reference of CSE 463 as mentioned above.(New first)

This was primarily a UX change rather than an actual change to functionality. The design of this course was in sharp contrast to other, more standardized courses.

3.3.4.Task #2 Prototype Rational

In general it is more pleasant to browse a website that has some standard layout and design, and while some customizability is obviously desired it is important that the basic layout and design remains consistent across the website to reduce cognitive load on the users. This change would result in the largest loss of customizability, but it comes with a gain on user enjoyment of the site.

3.4. Task #3

3.4.1.Task #3 Design

In addition to the change mentioned in 3.1 and 3.2.1, for this task I modified the discussion submission dialogue to make a few of the buttons stand out more. This is expected to primarily impact user experience, by making the steps to submit more apparent.

3.4.2.Task #3 Design Justifications

For the most part the process for this task was well designed with exception to the issues being covered by the other tasks. However, there are some steps specific to the discussion submission dialogue that could be made to stand out more, which makes it easier to transition between steps. In addition, I have made the subject and body of the attempted submission persistent across page changes so that an accidental click to another page will not destroy unsaved work.

3.4.3.Task #3 Prototype

The redesign for task 3 is a combination of the redesign for tasks 1 and 2. Similar to task 1, it clarifies and standardizes the location of the links the user is looking for and places them in a more intuitive location. Similar to task 2, it also standardizes the design of the sidebar while still preserving the user customizability to as large a degree as possible.

3.4.4.Task #3 Prototype Rational

As with the prototype, the rational behind this prototype is a combination of the rationals behind the tasks 1 and 2 prototype. The standardized user interface reduces the learning curve for new users and allows long-time users to continue with the intuition gained from other courses.

4. A/B Testing

4.1. Participants

7 participants were recruited from friends made through online forums such as reddit, as well as personal friends. The participants were not compensated. Unique Identifiers were generated using the first 5 numbers of the hash value gathered from the user's name.

Unique Identifier	Age	Country	Has used blackboard before	Experience with computers (1-5)
68044	24	United States	No	5
34513	19	Sweden	No	4
47355	21	Nigeria	Yes	5
71073	22	United States	Yes	5
33454	26	United States	No	5
23156	21	United States	Yes	5

4.2. Scenarios

Each user will be presented at the beginning of the scenario with a list of tasks to complete, which they may access at any time. Because of the manner in which these users are recruited, it is difficult to control the specific aspects of testing such as screen resolution, operating system, or device type. To compensate for this, each of the 6 users will participate in both the control and the test group, randomizing which group they participate in first. The instructions will be presented as the first window they open when accessing the test (screenshot attached in 6.4). This standardized method of presenting instructions reduces the chance of observer bias.

Each task has a single main pathway, which is covered in the respective cognitive walkthroughs (6.2). In addition, there is a single possible deviation that the first and second tasks share, whereby the user chooses to visit the course page via “Courses”->Course in question rather than by directly selecting the course on the homepage. For the control tasks, I expect that this would actually be a faster path despite the increased clicks needed to reach the destination due to the cognitive load of finding the course in the unsorted list presented on the homepage. As far as I know, there are no further possible deviations in either my tests or the actual Blackboard website. The primary focus of my redesign is to improve these main pathways, and not to reduce or increase other possible paths.

4.3. Equipment

Each participant will be asked to use a screen recording software to record their session. Once I have that, I will time both the individual tasks and how long it takes to complete all tasks together. Users will be asked to complete the tasks on chrome browser with a width of at least 1280px.

No other special equipment will be used.

4.4. Subjective Metrics

The users were given a background questionnaire to judge their experience with computers and blackboard in particular. They were also given two a post-session questionnaires (identical) after each portion of the test to gain insight into their experience using the website, which was the primary focus of this redesign. Below is a table of their responses after completing the control group and the test group.

Control:

User	Usability (1-5)	Design (1-5)	Likes Best	Likes least
68044	3	2	Vertical layout of information, plain text without many special characters, relatively lightweight UI	In no way does "hallway whatever" make me think of a discussion board. Whoever designed that better say that phrase EXPLICITLY or else people are going to be like "wtf" Also having "create thread" at the top left of the boards is completely antithetical to how most boards operate, it's almost intentionally offensive in its existence. There must be a better format than that.

User	Usability (1-5)	Design (1-5)	Likes Best	Likes least
34513	1	2	Not much. Inspecting elements and seeing some hideously poor auto-generated HTML and CSS was pretty amusing. Not in any way relevant, I know, but it was fun.	Incredibly difficult to use since the final project description is not in the place you thought it would be, and small things like the title of the discussion page link made everything much more confusing that it would need to be.
47355	4	3	Document type is indicated by a small imaged paired with the document	No proper Categories for items to find.
71073	2	3	The design was familiar with the navigation on the left side.	The content was not in intuitive places.
33454	1	1	Nothing	Nothing was intuitive on what you were supposed to do. Nothing was really labeled or labeled in a confusing way such as "hallway conversations" which was supposed to mean "discussion board". The design and layout changed between each course segment so you couldn't get used to anything. When looking at the course material and trying to find the objectives for the final project it didn't actually provide that material where you expected, in the section with the final project but in another section entirely.
23156	2	1	the sort for the homepage made more sense this time	the locations for the stuff I had to find made... no sense. at all. "readings" for a project description and "hallway conversation" for a discussion board?

Test:

User	Usability (1-5)	Design (1-5)	Likes Best	Likes least
68044	3	2	same as before, vertical space etc etc plus things were more clearly labeled	I swear to god MOVE THE CREATE THREAD BUTTON
34513	3	3	Much easier to use. Titles and menus were more intuitive simply by accurately describing the content. The final project stuff was much easier to find since it was placed in a logical place.	Not much, really. It's a normal site now.
47355	5	5	Sort by course ID option	Folder Categories
71073	2	4	The discussion board was actually titled appropriately	The organization of classes was not intuitive.

User	Usability (1-5)	Design (1-5)	Likes Best	Likes least
33454	2	1	In the POS 150 class could actually find the discussions section easier when it was labeled something that made sense.	It is still really difficult to navigate, doesn't have good design, and things are labeled and shown different from course to course.
23156	3	3	decently organized, everything is about where you would expect it to be	fairly ugly design, looks very web circa 2010

4.5. Quantitative Metrics

For this I recorded total time taken to complete all three tasks, as well as the number of clicks and the number of errors made when completing each task. As one goal of this project was to increase the usability of the site for both new users and users that already have an intuition gained from previous usage of Blackboard, these metrics will track how much trouble the user has finding the goals of each task. The only clicks that were counted were clicks used to navigate (i.e. not clicked used to change input box or highlight text).

Control:

User	Time to completion	Task 1		Task 2		Task 3	
		Clicks	Errors	Clicks	Errors	Clicks	Errors
68044	2:50	6	3	3	0	7	3
34513	4:30	7	3	3	0	5	2
47355	3:27	4	0	4	1	4	1
71073	8:43	9	5	4	0	6	2
33454	7:22	10	8	3	0	10	6
23156	3:36	7	3	3	0	6	2

Test:

User	Time to completion	Task 1		Task 2		Task 3	
		Clicks	Errors	Clicks	Errors	Clicks	Errors
68044	1:43	6	3	3	0	5	0
34513	3:33	3	0	2	0	4	0
47355	3:33	5	1	2	0	4	0

User	Time to completion	Task 1		Task 2		Task 3	
71073	2:23	4	1	2	0	4	0
33454	2:34	5	2	2	0	4	0
23156	3:25	3	0	2	0	4	0

4.6. Test results

For each measure taken, I performed an F-test to determine if variances were equal, then performed the appropriate T-Test. F-tests are not shown as they are not relevant to the outcome of this experiment.

T-test on usability:

	Redesign	*Control*
Mean	3	3
Variance	2	1.2
Observations	6	6
Pooled Variance	1.6	
Hypothesized Mean Difference	0	
df	10	
t Stat	0	
P(T<=t) one-tail	0.5	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	1	
t Critical two-tail	2.228138852	

T-test on design:

	Redesign	*Control*
Mean	3	2
Variance	2	0.8
Observations	6	6
Pooled Variance	1.4	
Hypothesized Mean Difference	0	
df	10	
t Stat	1.463850109	
P(T<=t) one-tail	0.08697419	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	0.173948379	
t Critical two-tail	2.228138852	

For both of the tests above, there is not a statistically significant difference between the control and the redesign of Blackboard.

For the objective measures, I will only include the T-tests that are statistically significant.

T-test on time to completion:

	Control	*Redesign*
Mean	304.6666667	171.8333333
Variance	20653.46667	2075.366667
Observations	6	6
Hypothesized Mean Difference	0	
df	6	
t Stat	2.158212105	
P(T<=t) one-tail	0.037129922	
t Critical one-tail	1.943180281	
P(T<=t) two-tail	0.074259845	
t Critical two-tail	2.446911851	

T-test on total clicks for task 1:

	Control	*Redesign*
Mean	7.166666667	4.333333333
Variance	4.566666667	1.466666667
Observations	6	6
Pooled Variance	3.016666667	
Hypothesized Mean Difference	0	
df	10	
t Stat	2.825495605	
P(T<=t) one-tail	0.008995171	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	0.017990342	
t Critical two-tail	2.228138852	

T-test on errors for task 1:

	Control	*Redesign*
Mean	7.166666667	4.333333333
Variance	4.566666667	1.466666667
Observations	6	6
Hypothesized Mean Difference	0	
df	8	
t Stat	2.825495605	
P(T<=t) one-tail	0.011152168	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	0.022304337	
t Critical two-tail	2.306004135	

T-test for clicks on task 2:

	Control	*Redesign*
Mean	3.333333333	2.166666667
Variance	0.266666667	0.166666667
Observations	6	6
Pooled Variance	0.216666667	
Hypothesized Mean Difference	0	
df	10	
t Stat	4.341215711	
P(T<=t) one-tail	0.000731791	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	0.001463582	
t Critical two-tail	2.228138852	

T-test for errors on task 2: No statistically significant difference.

T-test for clicks on task 3: No statistically significant difference.

T-test for errors on task 3:

	Control	*Redesign*
Mean	2.666666667	0
Variance	3.066666667	0
Observations	6	6
Hypothesized Mean Difference	0	
df	5	
t Stat	3.730019233	
P(T<=t) one-tail	0.006785362	
t Critical one-tail	2.015048373	
P(T<=t) two-tail	0.013570725	
t Critical two-tail	2.570581836	

5. Conclusions

5.1. Discussion of Results

The most surprising thing to me I found in this project was that absolutely nobody cared about how the courses on the homepage were ordered. I thought at the beginning of this that that would be a widely appreciated feature, but neither the people that started on the control nor the people that started on the test had any additional trouble finding the course they were looking for on the homepage.

Something that is obvious in retrospect but did not occur to me originally was that people that are participating in this class took significantly fewer clicks to find the location of the final project description on the original design than the people that had never used blackboard before.

From the analysis of the subjective measures, based on the usability and design measures there is no statistically significant difference between the control and the redesign. However, from user commentary on the site it's equally clear that nearly everyone preferred the layout and design of the redesign to the original. This discrepancy can be explained with the low sample size, or perhaps people just don't actually know what they like in a website.

From the analysis of the objective measures, we can glean a much clearer picture. For every measure, there was either no statistically significant difference (2) or the redesign performed better (5). For the two tasks with no statistically significant difference, the first can be explained by the fact that there were almost no errors on the control and so it was impossible to improve by that measure anyway. The lack of statistically significant difference on the second one frankly shocks me, and I cannot explain it.

5.2. Lessons Learned

I think the largest lesson I learned in this project was that designing a test is significantly harder than designing a website. The vast majority of problems I had completing this project occurred due to users not understanding what it was they were being asked to complete in the first case, significantly more so than them not being able to find what they were being asked to look for.

5.3. Conclusion

Overall I am quite happy with the performance of my prototype compared to the original design of Blackboard. I think there is a good deal of improvement for Blackboard, and considering it's a sit that millions of students use every year I think there is very good reason for it to improve. I think any future redesign attempts should be significantly more broad than mine, however, as a fairly frequent complaint was with the actual design of the site itself which was not addressed with my redesign prototype.

6. Appendixes

6.1. Heuristic Evaluation

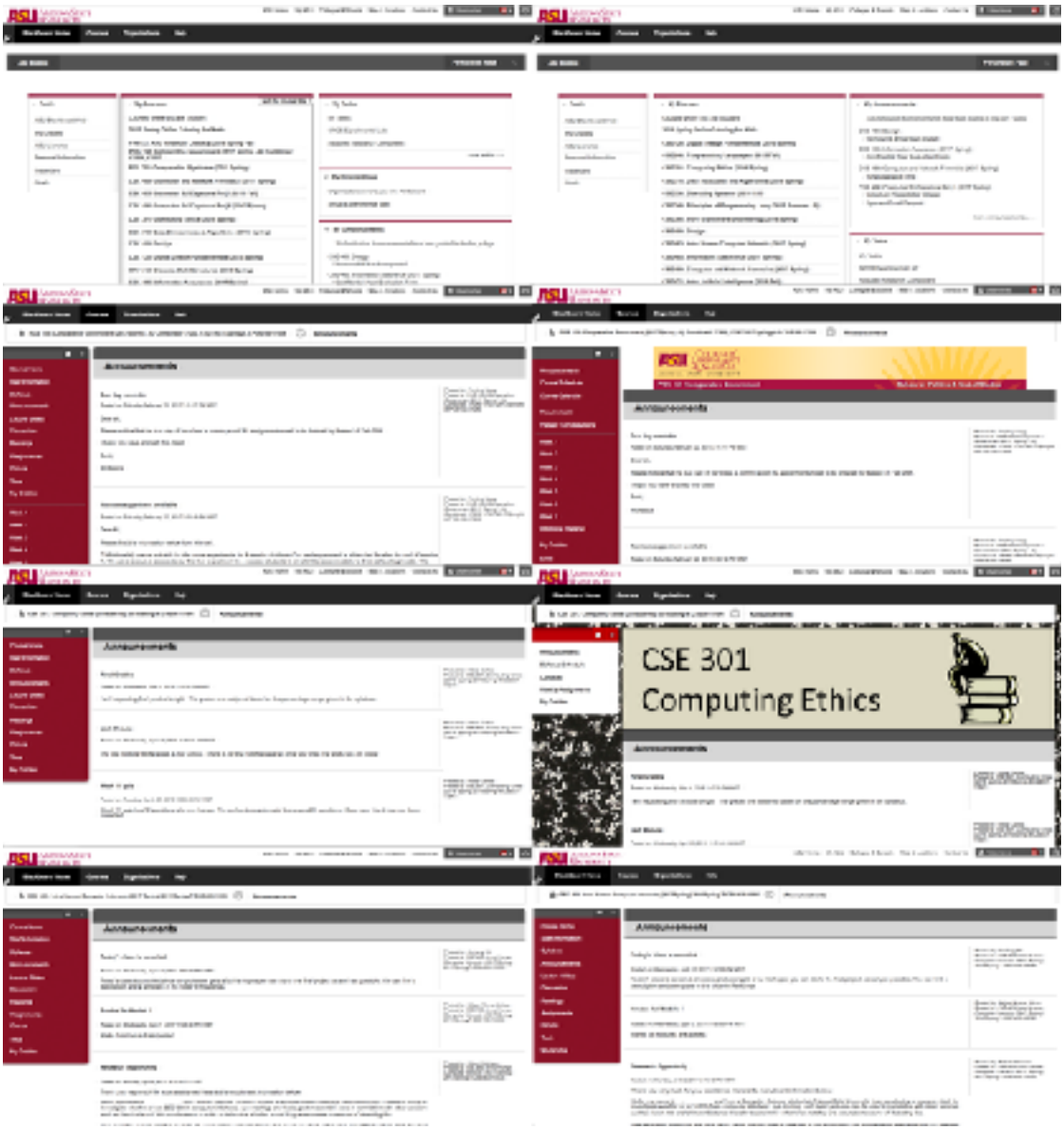
Attached as "Blackboard Heuristic Evaluation.xls"

6.2. Cognitive Walk-through

The three cognitive walk-throughs are attached as "Task[n]Walkthrough.pdf"

6.3. New GUI snapshots

New	Old



6.4. Instructions for participants

The user was presented with the initial background questionnaire, with instructions at the end to proceed to the axure hosted mockup/prototype after completing the questionnaire. From there, instructions to the user were integrated into the test in such a way that the user would receive their next task upon completion of the previous task. Instructions were as follows:
Task 1: Please find and enter the fourth item for the CSE 463: Intro Human Computer Interaction final project description.

Task 2: Please find and enter the find the first course learning outcome in the Syllabus of course CSE 301: Computing Ethics.

Task 3: Please submit a discussion question with the title “Discussion question relating to CSE 463” and the message “This question is an example of a possible question that may be asked in a discussion” to the discussion board of POS 150: Comparative Government.

From there, the user was directed to a second questionnaire depending on if they were originally assigned to the control group or the test group. This questionnaire instructed them to return to the axure site on completion to participate in the second round, where they were assigned to whichever group they did not initially begin in. The instructions presented in this round were identical to the instructions presented in the first round. At the end of each of the post-session questionnaires, the user was instructed to email the screen recording of the previous session to my ASU email for evaluation.

6.5. Researcher guidelines

I needed only to verify that the user was willing and able to record their screen for this session, and to email the resulting video at the end. This process was designed to be viable with minimal interaction on my part both to reduce bias and to enable me to recruit users from around the world rather than simply those I happen to be in immediate proximity of.

6.6. Background questionnaire

Name/pseudonym: _____

Age: __

Country: _____

Have you used blackboard before?: [ ] Yes [ ] No

How experienced are you with computers?: Not at all [1] [2] [3] [4] [5] Extremely

6.7. Post-session questionnaire (Taken twice per user)

Name/pseudonym: _____

Please rate the usability of this site.: [1] [2] [3] [4] [5]

Please rate the design of this site.: [1] [2] [3] [4] [5]

What did you like best about this site: _____

What did you like least about this site: _____