

FlunkLess

Better than just being there

Cogs102C – Cognitive Design Studio
Prof. Jim Hollan

Vlad Bakhurinsky, Jared DeFig, Lucas Medeiros de Paula, Meena Kaushik, Crystal Kwok, Hui Ping Lee, Alex Peterson, Michelle Wang

Department of Cognitive Science, University of California San Diego

Finished 11 June 2014; Submitted 11 June 2014

Table of Contents

1. Introduction	
1.1 Motivation and Overview -----	3
1.2 Synchronous vs. Asynchronous Communication -----	4
1.3 Twists and Turns -----	4
2. Methods	
2.1 Timeline -----	5
2.2 Contextual Interviews -----	6
2.3 Logistics -----	6
3. Results	
3.1 Building the Affinity Diagram -----	7
3.2 High-Level Categories -----	8
3.3 Cultural and Sequence Models -----	10
4. Design Process	
4.1 Main insights and Design Ideas -----	14
4.2 Personas -----	15
4.3 Visioning (TA and Student versions) -----	19
4.4 Paper Prototype Design -----	23
5. Prototype testing	
5.1 Interview Process -----	26
5.2 Paper Prototype Interview Protocols -----	27
5.3 Insights -----	27
6. Reframing -----	28
7. Final Design	
7.1 Focus and Flare -----	30
7.2 New Functionalities -----	30
8. Competitive Analysis -----	34
8.1 Overview -----	35
8.2 Piazza -----	35
8.3 TED -----	36
8.4 iClicker -----	36
8.5 Facebook -----	36
9. Discussion -----	36
10. Future Directions -----	37
11. Acknowledgments -----	38
12. List of References -----	39

I. Introduction

1.1. Motivation and Overview

How do you effectively engage and motivate participation from over a hundred students during a typical college lecture? This issue is common among large universities in which students are unable to actively participate in lecture due to factors such as time constraints and lack of tools to facilitate discussion within a big group, resulting in an one-way interaction encouraging ‘content delivery’ strategies. Many universities utilize these strategies in which the professor simply delivers the class material to the students without requiring or encouraging participation (Newstok, 2013). Students at the University of California, San Diego (hereinafter referred to as UCSD) are no stranger to this issue and so we approached this issue by identifying and exploiting a resource that is already found in large lectures – the use of currently available technologies. We approached this question of how to effectively engage and motivate participation by facilitating communication online.

The vast majority of college students today bring a digital device to lecture, such as a computer, a tablet, or a smartphone, often for note-taking. The classrooms are equipped with wireless Internet connection, which allows the students to access course material and other resources during lecture. Thus, we decided to rephrase our question as follows: How can we use the digital devices available to encourage students to engage with the lecture material?

Although plenty of virtual classroom tools are out there (e.g. TED, Piazza, Thiscourse), as well as online learning courses (i.e. Coursera, Khan Academy, MIT OpenCourseWare), there are no effective platforms that integrate the lecture experience with the devices used by students without trying to replace the in-class lecture. Instead of having the students use their devices to access social networks and online shopping in an attempt to escape ‘content delivery’, we want to create a virtual tool to augment and supplement live lectures. Students would be able to post questions and comments as they come to mind, as well as links to related materials as they encounter them (wanted or not, students do browse the internet as professors lecture). Students would also be able to vote on each other’s posts, creating a priority-ranking system for the teaching staff to address. Our mission is to create a platform that encourages group conversation and promotes deeper engagement with the lecture

material thereby shifting the currently employed content delivery strategy (“passive” learning) to a more “active” learning.

1.2 Synchronous vs. Asynchronous Communication Tools

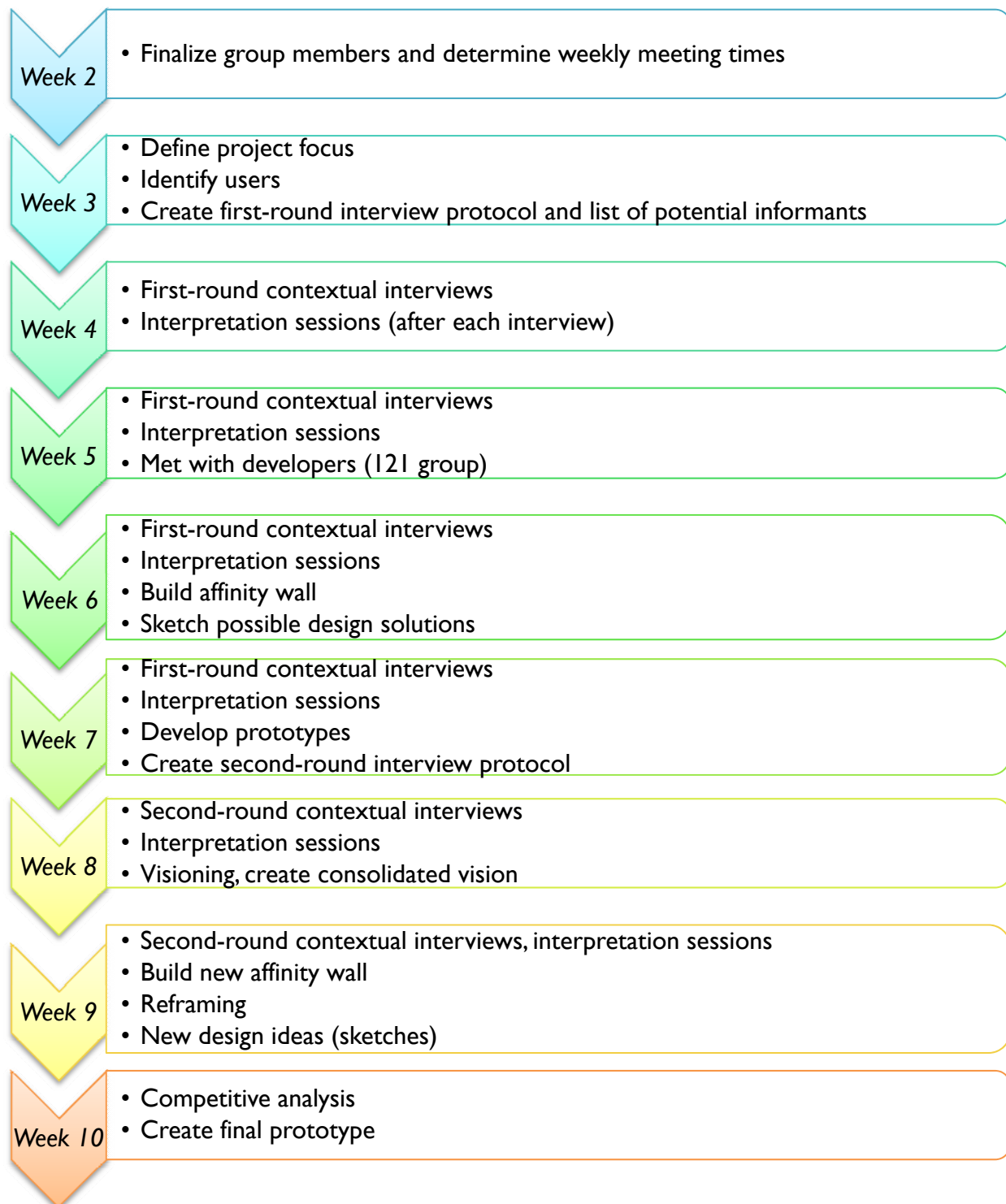
There are two general categories regarding communication platforms: synchronous, or real-time, and asynchronous. Asynchronous refers to means of communication that involve a time lag between message and response, where people can communicate over an extended period of time. This type of tool is convenient for it is flexible to users’ schedules. Some examples of asynchronous communication tools are discussion boards and e-mail threads. On the other hand, synchronous refers to means of communication that happen in real-time, connecting the users at the same place in time. Some examples are instant messaging and video conferencing. Throughout the paper we will refer to this distinction as a way of framing the use of FlunkLess and comparing it to other currently available tools.

1.3 Twists and Turns

The problem space described above differs from the one we started with. Before conducting interviews, we chose to explore the different ways in which Facebook and other tools (Google Docs, TED, Piazza, etc.) are currently used for academic purposes, which we refer to as our *first direction*. Based on the data from the users along with some interaction with our group of developers (the students currently enrolled in COGS 121), we took the problem space in a *second direction*. We wanted to explore possible alternatives for creating a collaborative workspace in which professors and teaching assistants could hold virtual office hours, share materials, and engage in class discussions. Finally, after testing our prototypes with users in the second round of interviews, we arrived at our *third direction*, which is the use of digital devices during lectures to support in-class discussion.

2. Methods

2.1 Timeline



2.2 Contextual Interviews

Throughout the data collection process we used the methodology of contextual interviews, which takes place in the context of the activity (Hollan, 2014). We asked our participants to perform everyday activities related to managing course content in the same way they would without the presence of the interviewer, as to fully capture the activity and incorporate the collected data into our design. We aimed to conduct the interviews in the usual workspace of the informant in order to make reliable observations regarding habitual procedures.

Prior to conducting our contextual interviews, we established interview protocols in accordance to our three user types - professors, teaching assistants (TAs), and students. Our initial question and primary focus of the interview was to discover what platforms these users required for academic purposes, especially when facilitating group projects in classes (TED, Facebook, WhenIsGood, Doodle, Google Docs, etc.). For full list of protocol questions, please refer to the binder tab#4. We also established a few things before transitioning from a contextual interview into the contextual interview part: we ensured that all informants signed a consent form and then introduced ourselves, an overview of the contextual interview process, and project focus. During the contextual interview portion, we made sure to keep the dialogue focused on concrete examples (no speculations or assumptions), employed the apprentice/master model (the interviewee was the master while the interviewer tried to learn his work practice through the role of an apprentice), collected artifacts (physical objects that were deemed relevant for our topic), and discussed use (likes/dislikes) of the platforms (Hollan, 2014). The master/apprentice model allows the apprentice (interviewer) to adopt the “humility, inquisitiveness, and attention to detail needed to collect good data” (Hollan, 2014)

2.3 Logistics

To gather information about our first direction - the use of Facebook and other platforms to manage courses - we targeted three job roles: professors, teaching assistants, and students. Each interview lasted for an hour on average, during which the interviewer took notes supplemented by either video or screen recording. We conducted a total of twelve interviews in the first stage (six students, four teaching assistants and two professors). Within forty-eight hours of each interview, we conducted an interpretation session to “review, analyze, and capture key issues” (Holtzblatt, 2005). In these interpretation sessions, the interviewer

recapped the entire interview with another member acting as a note-taker and remaining group members participating to identify holes, propose design ideas, ask clarifying questions, or add insights. During the interpretation session, the note-taker diligently records the conversation to preserve the discussion. Each interpretation session averaged forty affinity notes (key issues). The users were identified using the following system, and shall be referred to as such throughout this paper in the following manner:

Students = Sxx*

Teaching Assistants (TAs) = TAxx*

Professors = Pxx*

*xx denotes numbers, such as S01.

3. Results

3.1 Building the Affinity Diagram

After our interviews and interpretation sessions, we needed a way to visualize the results to see patterns of the different issues and insights presented by our users. According to Holtzblatt, the affinity diagram is the best way to tangibly visualize the data in an organized and coherent way that reveals our users' needs (Holtzblatt, 2005). We translated the issues, triggers, intents, preferences, and other insights produced from the interpretation sessions into affinity notes (represented by yellow post-it notes). All of the notes on the wall were written in first-person tense from the user's perspective (e.g. "I like to share class material"). We started building the affinity diagram from the bottom-up; we began by identifying commonalities between the affinity notes and grouping them together in a column on our affinity wall. We then categorized the notes into overall themes and work distinctions creating our first-order clusters (represented by blue post-it notes). Next, we organized the first-order clusters into common themes to create second-order clusters (pink post-it notes), and then again to create third-order clusters (purple post-it notes). As we got higher on the wall (first-order to second-order and so on), the themes became increasingly generalized. Ultimately, the affinity diagram not only identified breakdowns that the user encountered, holes in our data, and common themes, but also inspired potential design solutions.



Figure 1 - Panoramic view of Affinity Diagram

3.2 High-Level Categories

In total, we ended up with 215 data points (yellow), 32 low-level categories (blue), 12 mid-level categories (pink), and 4 high-level categories (purple). The data showed what our users felt were important to them and the concerns they had in regard to effective learning in the classroom and group projects. Our four high-level categories were communication, finding, socializing, and usability of technology.

Communication

1. *Effective and intuitive platform.* We learned that our users felt that being able to easily communicate with students, teaching assistants, and professors was important in order to save time and gain important information in regard to the class. Users were also more likely to use an application if they were already familiar with it or if it was easy to use, such as Facebook, as discussed by a professor (P01): “students respond to Facebook posts quickly.”
2. *Confidence to ask questions.* Our student users expressed that they often felt intimidated by the teaching staff and were afraid to ask questions and communicate with the professors and TAs face-to-face, as mentioned by a teaching assistant (TA03): “Facebook is less intimidating for students; students are more willing to ask professors and TAs questions on Facebook.”
3. *Mass announcements.* Our users, especially professors and TAs, stressed the need to easily make mass announcements and ensure students receive them. One of the TAs we interviewed, TA03, said “there is no announcement

when grades are posted on TED, so [they need to] make an announcement on Facebook.”

Finding

1. *Search engine/Information organization.* Our users often had trouble searching for material they needed in the midst of unorganized announcements and questions, such as when S03 “could not find the syllabus on TED,” or when S01 “kept scrolling down [the Facebook page] in order to find relevant material.”
2. *Activity notifications.* Our users also wanted to be notified of activity, but often did not care for irrelevant questions or material people posted up. This is illustrated by a professor (P02): “[I like] how Piazza allows you to have a ‘pinned post’ that sends an email to all the students attached to the roster.” A student, S01, also mentioned how “Facebook chat can be annoying with too many people in it, especially when people may be getting irrelevant messages.”
3. *Redundancy.* Professors and TAs did not want to answer the same question repeatedly, like TA01 who “gets spikes of emails around projects, tests, and when the professor was unclear”.

Socializing

1. *Sharing material.* Our users expressed that they would like to share material, whether it is class notes, their own personal projects, or articles the professor would like the students to read. S02 said that her class group and professor “had a shared folder for shared readings.” S01 also said that “students share pictures from lecture slides or their own notes in the Facebook group.”
2. *Developing in-class relationships.* One of our users, TA03, thinks “it is easy to confront a professor on Facebook, because students feel like they can say more personal things.” Our student users wanted to be able to get to know more people in their classes, especially in large lectures which are often less

conducive to meeting new people. S03 mentioned that their “Facebook fan page helped to form study groups.”

3.3 Cultural Model

After reviewing our affinity wall, we created a cultural model, which is a model that reveals influences on the different users. Through the first round of interviews, the group encountered many different cultural beliefs about the use of Facebook for academic purposes. Professors, teaching assistants, and students all have contrasting beliefs about the usage of Facebook primarily because of their different job roles. We created a cultural model to determine how we can address these different beliefs to develop a platform that solves our target users’ concerns about using Facebook for academic purposes.

Professors. For professors, Facebook is viewed mostly as social media. P01 stated that he does not post academic content on his Facebook page, but rather on his physics department course website under the UCSD domain. This makes the professor feel safer about the protection of the content rather than posting it on Facebook. This brought up an interesting phenomenon for us. The professor created the Facebook page only as an academic communication platform, but not to share academic content on the page. Despite the fact that both of the platforms are public, the professor believes Facebook is more informal and lacks protection of academic materials.

Teaching Assistants. Teaching assistants have the cultural belief that Facebook is a social platform for friends, and is not appropriate for communication between students and teaching staff. Several interviews revealed that teaching assistants do not feel comfortable using Facebook to communicate with students due to multiple reasons including a department rule that discourages personal relationships between TAs and students, biases towards grading, and a desire to separate academic and personal life. This belief changes how they act on Facebook for academic purposes. This is illustrated from TA01’s interview, where he believes that Facebook is for his own personal use, and thus he does not use Facebook for any academic purposes. For TA02, since he cannot and does not want to be friends with any of his students, he asks a student to help him to create a Facebook group. The same concern appears in the interview with TA04, who does not want her students to see details about her personal life. She even thinks that using Facebook for academic purposes can be unprofessional. These

behaviors are all influenced by the Teaching Assistants' initial cultural beliefs about Facebook and guidelines about TA responsibilities.

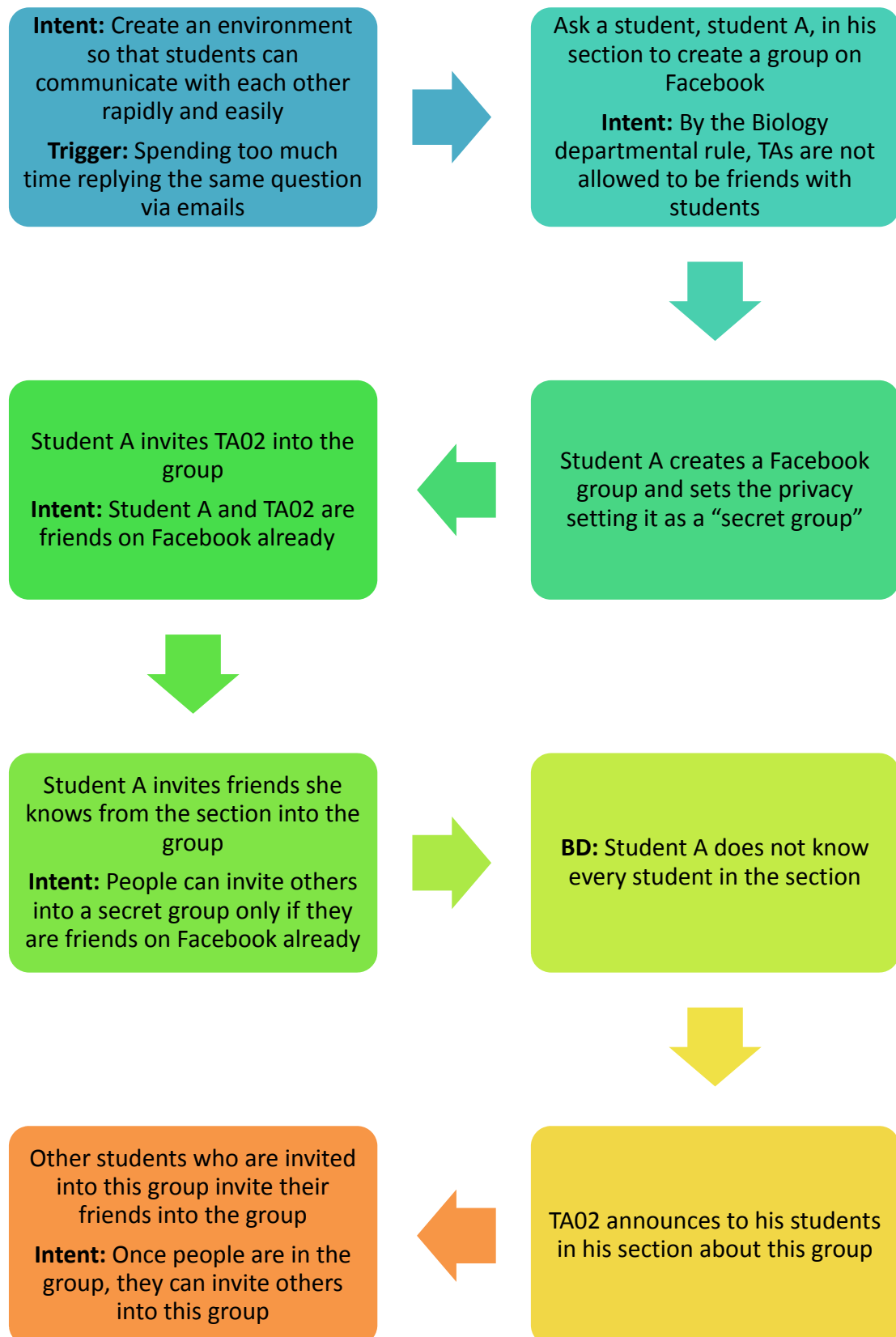
Students. Students believe that Facebook is a safe and convenient place for them to share their information and communicate with others, as shown throughout our interviews. S01 stated that everyone is “selfless” in their Facebook group; all of her classmates are willing to share their notes and collaborate in order to better understand the material. S06 thinks Facebook is convenient for contacting her friends for information or help and provides the opportunity to contribute her notes to the Facebook group. Most of the students we interviewed did not believe there are any privacy or copyright issues on Facebook. Because most students use Facebook on a daily basis, Facebook provides a user-friendly and convenient environment for students.

From these three different perspectives about Facebook, we can see that the usage of Facebook will vary depending on the user's job role and personal beliefs, therefore making it crucial that our design accounts for these perspectives and concerns. Ultimately, we need to make sure our future platform is safe, easy to use, and does not confuse academic and social identities.

3.4 Sequence Models

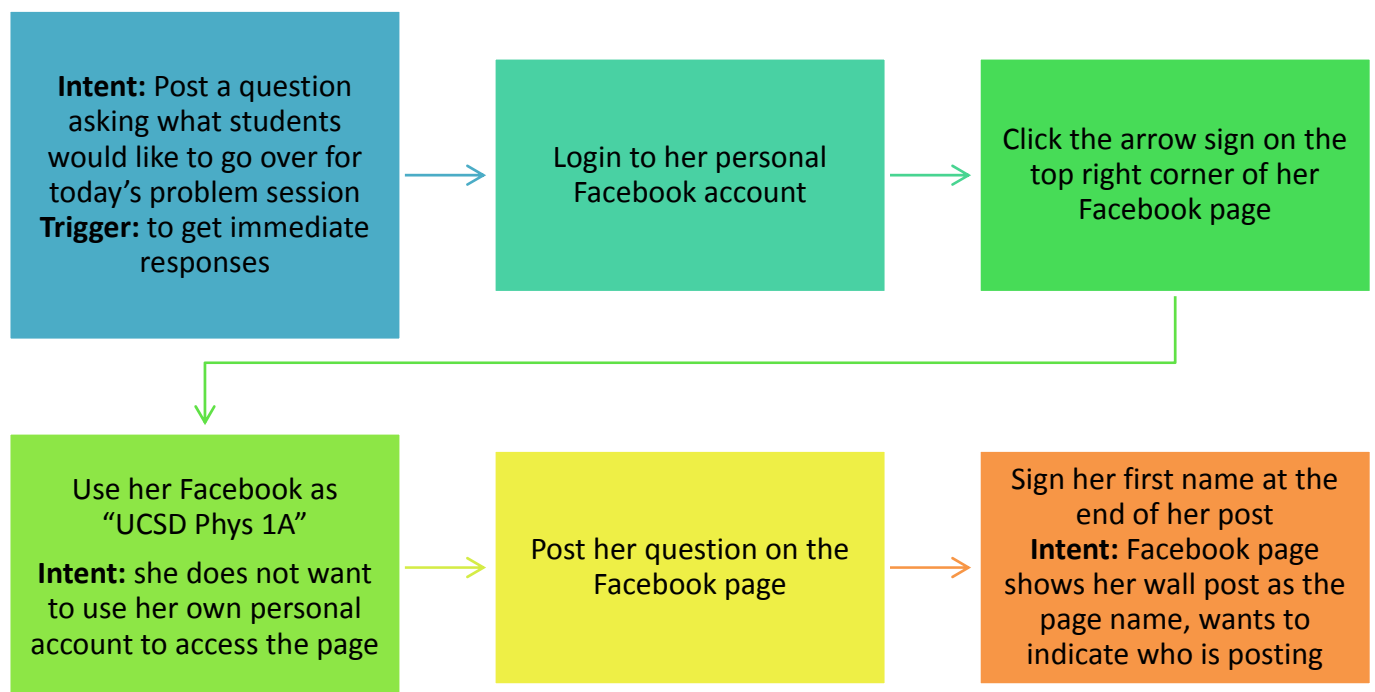
Sequence models are step-by-step sequences done while completing certain tasks. We created a sequence model in order to show the work and complexity for a teaching assistant to create an academic group on Facebook and highlight current issues. By translating these steps into a physical step-by-step list, we can clearly see that teaching assistants and professors need a better system to achieve their goal. It also provides a retrospective account that reveals the intents, trigger, and breakdowns. There are three major tasks that the teaching assistant needs to do in order to create a group on Facebook. First, the user must ask a student to help them to create a group. Second, the student needs to have TA's Facebook account, so she can add them into the group. Third, in order to be added into the group, you must have a friend already in the group to receive the invite. The initial intent is that the teaching assistant wishes to create a friendly and convenient environment for students to collaborate and communicate with each other more easily and faster.

Title: Create a Facebook group for students in discussion section



We created another sequence model in order to illustrate the current usage of a Facebook page as an academic platform. Our goal was to uncover the positive features of Facebook pages and what features Facebook lacked. The following model captures a teaching assistant's basic needs and intents for an academic platform. This sequence model is based on an interview with a teaching assistant (TA03) who is an administrator of a Facebook page for a physics course. She believes that the Introduction to Physics course can be mundane for students and so she hopes that by using Facebook she can increase student participation and strengthen communication with students to create a more interesting learning environment.

Title: Post a wall post on the course page on Facebook



4. Design Process

4.1 Main insights and Design

After identifying key insights in our high-level clusters, we decided to concentrate on three central themes from our entire affinity diagram to incorporate into the design of our first direction. The design processes were guided by the initial key insights gathered from our interviews: privacy, sharing material, and student engagement.

Privacy: Keeping personal and academic lives separate. Students, TAs, and especially professors do not want to mix their academic and social lives. For this reason alone, many professors and some TAs avoid using Facebook altogether because they see it as a social media platform and not as a tool to be used to facilitate class discussions. The way some professors and TAs avoided the privacy concern is by the creation of a Facebook page through which they posted not with their real name, but as the name of the page itself (an administrator privilege). Some TAs, who used their personal account to manage Facebook pages for a class, got into awkward situations such as the denial of friend requests from students. Since a Facebook user is not notified of private messages unless they are from a friend, one TA recounted an instance when she discovered a student sent her questions during a prior quarter that she didn't see for months (TA01). To address the privacy issue, we tried to design a platform that did not require a Facebook account to login, but had the option to for convenience, which allowed users to have some level of anonymity.

Sharing: Users wanted to be able to share their ideas, work, articles, and other resources. Users, especially students, felt a great sense of satisfaction when they share and help their peers. Students use Facebook class pages to share their notes. One student even went through the effort of typing up their own notes after class and sharing them with the rest of the class because the professor did not permit the use of computers in the classroom (S01). TAs often use Facebook or TED to share relevant notes and articles mentioned in lecture to assist their students (TA01). We tried to incorporate this into FlunkLess by having a drop-down menu to identify the type of link being shared (Dropbox, Google Docs, etc) and having a hyperlinked text instead of just pasting URLs to make sharing easier.

Engagement: Keeping 200 student motivated. One professor (P01) wanted to encourage more of his students to engage in his classroom, through use of iClickers, but did not grade or

require them because he felt that forced participation isn't the best way to engage students. He created a Facebook page for his Physics class to encourage student engagement and knew he was "onto something" when a student replied to his post within ten seconds. He went on to post information, news articles, videos, interactive demonstrations, and other media. His TAs engaged their students prior to section by using Facebook to gather suggestions for topics of discussion to avoid the blank stares TAs often get when they start the section with "What would you want to talk about today?".

4.2 Personas

Based on our contextual data, we created personas, which are descriptions of typical users drawn from the actual data collected (Holtzblatt). Our personas focused on the three job roles we targeted: the professor, teaching assistant, and student.



Professor

Name: Dr. Nick Goodman
Age: 40
School: University of Chicago
Department: Psychology

Nick is a dedicated man who loves the subject he teaches. He is enthusiastic when talking about psychology and the mind, and he tries to transfer some of this passion to his motivated students. Nick, however, has a limited amount of time to spend on his lecturing duties for he also runs a lab and a household. In his most recent course, an Introduction to Psychology with almost 200 students, Nick found challenging to get students to actively participate in discussions during lecture. Nick is very concerned with providing tools for his students to interact with each other and the material. He strives to make the most out of his time with the students by providing online resources such as readings and Q&A forums and is very accessible through frequent office hours. Although he is well aware that some students will be less engaged than others for a variety of reasons, Nick wants to feel like he gave the

opportunities and those interested took advantage of them, as illustrated by his philosophy: “You can take the horse to the water, but you cannot make them drink”.

Goals

- Efficiently communicate with students despite time constraints
- Provide support, resources and feedback for his students
- Share additional material for motivated students
- Provide sufficient opportunities and resources for students to learn and engage with material

Roles

- Coordinate and supervise teaching staff (TAs, IAs, etc.)
- Determine overall class goals, curriculum, and vision
- Provide a structured and clear syllabus that states expectations, deadlines, and requirements
- Choose digital platform(s) for communication, sharing material, and providing feedback
- Lecture and hold office hours

Key Tasks

- Set up a system(s): Piazza, Google Site, ThisCourse, TED, FB page, TurnItIn, etc.
- Answer questions about class content, assignments, logistics, etc.
- Provide information about announcements, grades, updates, etc.



Student

Name: John Wannapass

Age: 19

School: UC San Diego

Major/Year: Mechanical Engineering, Sophomore

John Wannapass is a Mechanical Engineering student who is involved with his fraternity and is interning at a local start-up company. He feels that while learning the material is important, time and his other responsibilities do not allow him to fully dig into the material and therefore is primarily focused on simply receiving get a good grade in the class. He often misses his early morning classes due to taking a full course load, holding a leadership position in his fraternity, and working 20 hours per week. He needs a way to catch up with missed

material not only through office hours but also through podcasts, shared lecture notes, etc.

John just wants to know the material needed for a good grade in the class.

Goals

- Effectively communicate with his classmates, TAs, and professors
- Easily access and search for important class information, questions, and updates
- See pinned announcements, content posted by teaching staff, questions asked by other students, instructions for group projects, etc.
- Professionally communicate with professors and TAs
- Control privacy settings to separate academic and social profiles
- See which of his friends are taking the same classes
- Write group papers, including recording notes and reminders, tracking comments, editing, and having multiple drafts
- Coordinate group members' schedules

Roles

- Achiever: learns and studies the material needed to get an A in the class
- Questioner: asks questions in order to understand the material better
- Scheduler: tries to balance many extracurricular activities with school work

Key Tasks

- Reading the material the professor posts online
- Going to lecture and taking notes
- Asking questions to the TAs, professors, and other students
- Attending group meetings
- Writing a group paper



Teaching Assistant

Name: Stephanie Marina

Age: 22

School: UC San Diego

Department: Biology

Jobs: Graduate student, undergraduate teaching assistant

Stephanie is a Teaching Assistant for BILD 3, an undergraduate course titled “Organismic and Evolutionary Biology”, at UC San Diego. While she enjoys teaching Biology to undergraduate students, she is also in her first year of her graduate career. She is currently working towards her Master’s degree in Biology. Stephanie enjoys working with students and

served as a TA once before as an undergraduate student. She is often known to go above and beyond for her students by providing study guides, sharing lecture notes, and having frequent office hours. In addition to being a TA, Stephanie is taking graduate courses and conducting research and so she does not have time to answer the same question repeatedly or juggle multiple communication platforms.

Goals

- Improve the quality of undergraduate education, especially within the Biology Department
- Support the students and the professor
- Facilitate communicative, participative learning in her discussion based classes
- Make sure her students understand the material and do well in the class

Roles

- Communicate Professor's message to students and vice versa
- Lead discussion in sections
- Provide class resources
- Maintain confidentiality
- Maintain professional distance with students

Key Tasks

- Lead a discussion section and facilitate an educational environment where students feel comfortable in discussing difficult concepts or asking her questions about the topics
- Help students prepare for the midterms and final exams
- Be accessible to students
- Grade papers
- Assist in creation of quizzes and exams

4.3 Visioning

Visioning is both a grounded brainstorm and storytelling session in which the group collects data from the affinity wall and imagines future function (Holtzblatt, 2005). During our visioning session we illustrated the future function through the perspectives of a student and a TA. We started with the representation of the home page, debating lists versus boxes for the courses, and how to notify users of activity through sizes of boxes or bubbles for each course or through different colors and/or color intensity. We discussed what kind of material should be listed under a “recent history” column to catch up the user on activity in the rooms they left.

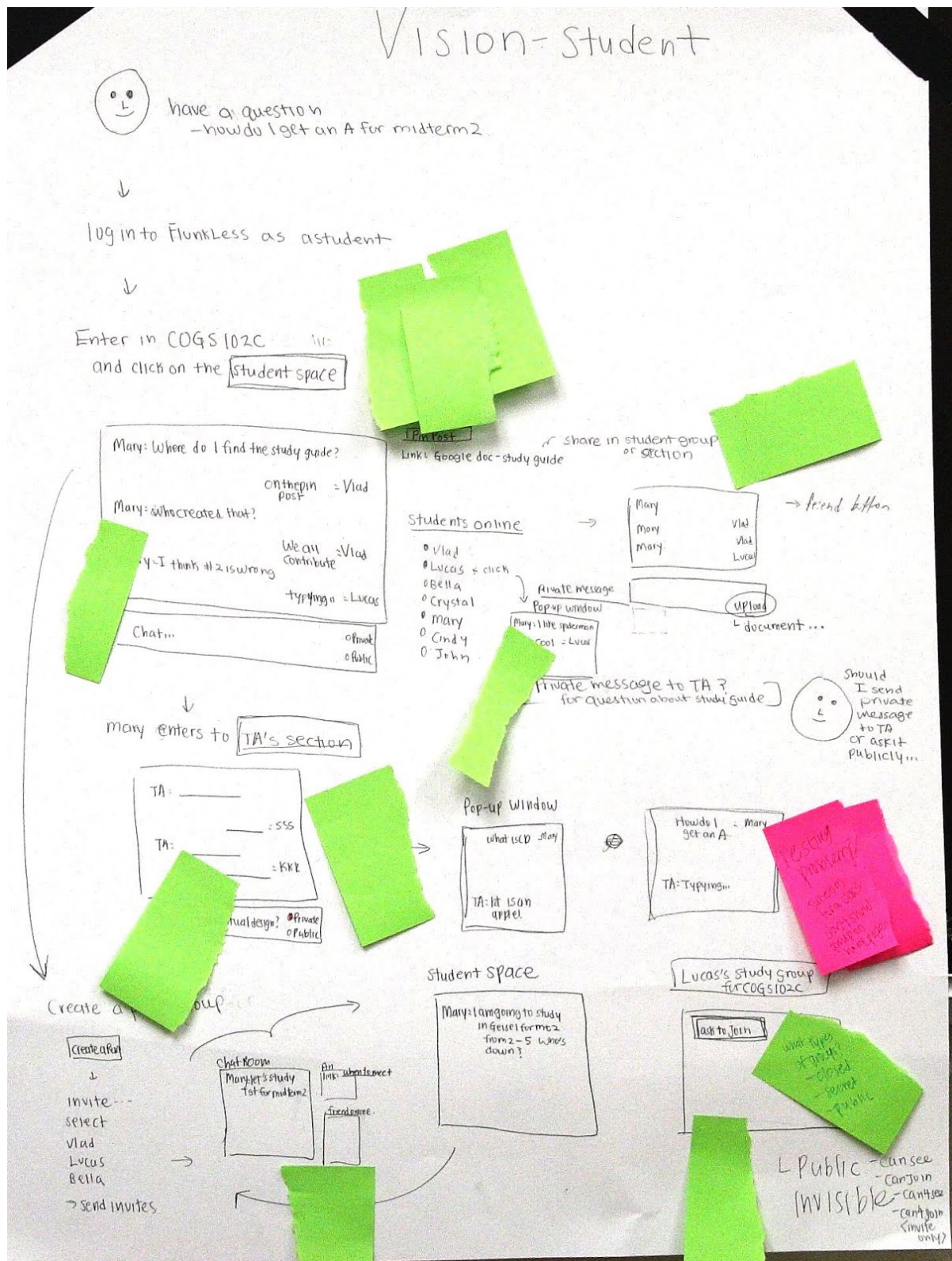


Figure 2 - Visioning board from student perspective.

In figure 2 shown above, the student user has a question on how to succeed on a midterm. The user (Mary) logs on to FlunkLess, selects COGS 102C, enters student space - the general chat room, sees the current or last chat and comment activity, and provides answers to any unanswered questions. Mary created a study guide that she wants to share with her classmates and does so by linking her Google Doc and pinning the post.

Mary has a specific question from the study guide and looks to see who is online. She notices that the TA is online and clicks on their name which opens a chat box at the bottom of the page. Mary types in her question into the chat box and sends a private message to the TA. Mary also wants to study in person with the people are currently online now, so she invites all her friends to an invisible (private) chat room, and asks them who wants to study in the library.

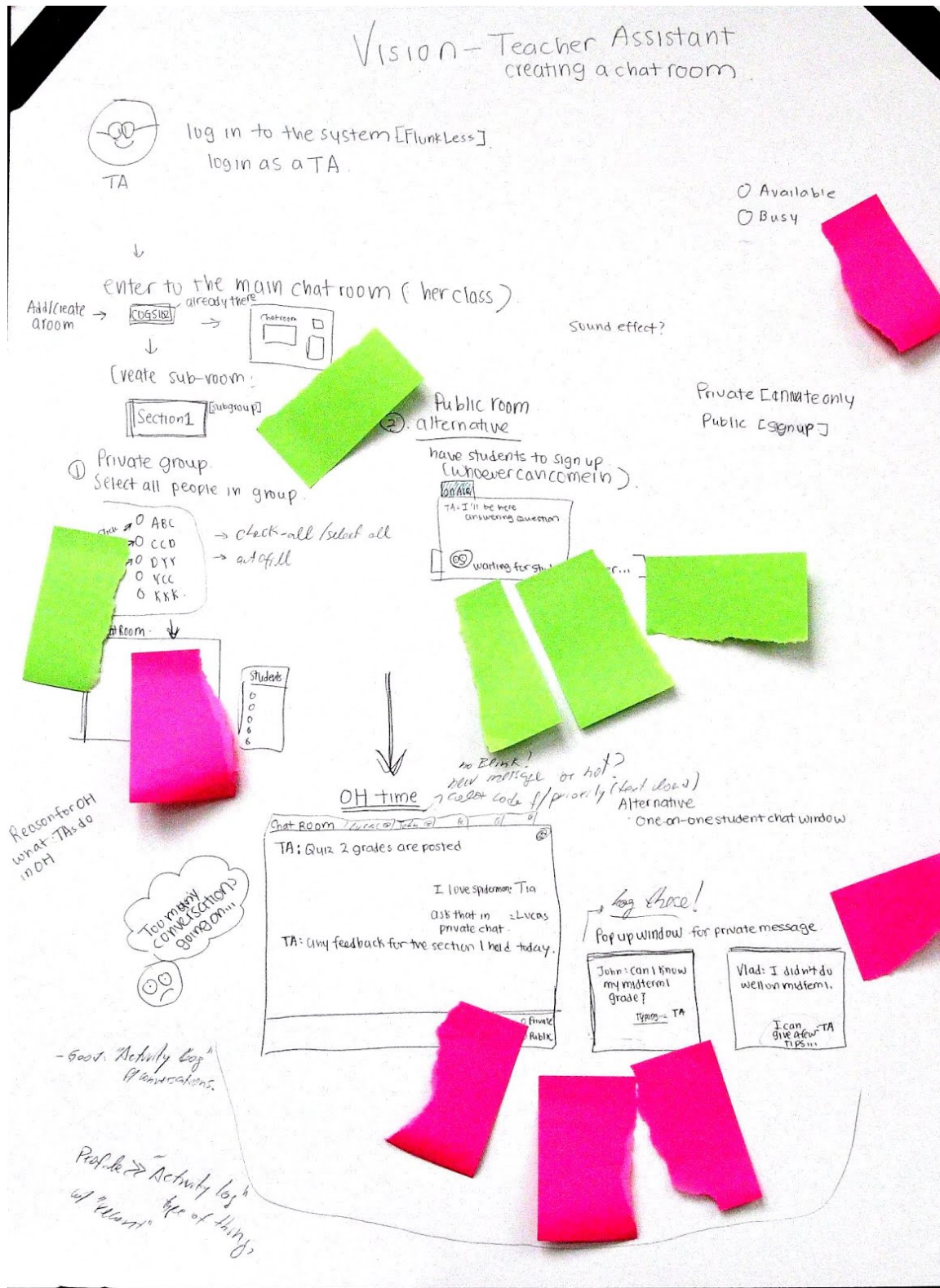


Figure 3 - Visioning board from perspective of TA

In Figure 3 above, the TA (Stephanie) wants to create a room for her section. She logs in to Flunkless and attempts to create main room for the course but FlunkLess shows there's already one present. She enters the room, and creates a sub-room for her section. This room can either be a public room where anyone in the class can join or a private room where the TA invites only students from their section. Stephanie sets the room as "private". Stephanie then announces to her section chat room that the quiz grades have been posted. Several students in her section then used the individual chat boxes to message her. They asked Stephanie some private questions such as the grade they got on midterm. She replies both the private messages and questions posted in the general chat room but finds difficulty in managing the various conversations.

4.4 Paper Prototype Design

Based on the data points we collected from the first round of interviews, we found that there were 36 data points that favored a platform that allowed easy and quick communication. After collecting our main insights from our user-centered data, we decided to design a platform that provides synchronous communication where professors, teaching assistants, and students would be able to receive immediate responses and check posts easily. To address the conflicting perspectives of Facebook use for academic purposes illustrated by the cultural model discussed in section 3.3, we decided that this platform should be kept separate from Facebook. Moreover, after a discussion with the students from COGS 121, we wanted to create a communication platform that functioned as a "collaborative workspace." We decided to go with the idea of virtual office hours in order to provide easy and effective communication between the teaching staff and students. The students from COGS 121 created a working prototype before we designed our paper prototype that included a chat function, a way to manage different groups and rooms for classes, important posts, and a place to show which people were online. While their prototype was impressive, we felt that our data inspired a different design and so we created our own paper prototype. We created the paper prototypes using post-it notes for the wireframe and layout so that each function was moveable.

On our homepage, there is a list of available chat rooms for each available class for the users to add. The default for every enrolled student was a general chat room for the class. In the general chat room, professors and teaching assistants are able to efficiently answer student questions while students are able to quickly and easily post their questions. One of the teaching assistants stated that, “ I don’t like to answer the same question over and over again (TA02).” This public chat room can address this concern by allowing students to see which questions have already been asked and enabling teaching assistants to answer it once (rather than multiple times) publicly.

Multiple rooms exist within the main room. The “staff room” is visible only to the professor and teaching assistants, and the “student room” is only visible to the students. The purpose of the staff room was to allow the teaching staff to discuss topics such as student progress, changes to course curriculum, grading, exams, etc. As shown in the affinity diagram, student users stated that they would like to form study groups easily, while professors and teaching assistants would like to promote collaboration between students. Therefore we believe that having subgroups alongside the main chat room would help students to collaborate more efficiently and easily. Users can also join or create another subgroup by clicking “add more” button on the sidebar. After the user creates a new chat room, he or she can invite others to join from selecting people in the “online” section.

There are two privacy settings for the rooms available. One is “invisible”, and the other is “visible”. For the invisible group, only people who are in the group can see the contents and people can only be added to this group by invite. For the visible group, anyone can see the group and join. We derived this idea from the group privacy functions on Facebook. However, Facebook provided too many privacy setting options which made the entire process unnecessarily confusing. To prevent confusion, we decided to condense the privacy settings into two options.

The main purpose of the chat room is to have the professors and teaching assistants hold their office hours virtually. Students can chat with the professors and teaching assistants in an individual chat box. By using individual chat boxes, students can feel less intimidated (TA03). This also provides teaching assistants an easy way to answer and communicate with students and can increase frequency of office hours.

In the chat room, there is an easy upload button for students to share any kind of documents or link. 10 data points suggested that students like to share their ideas, work, and other resources to collaborate with their classmates. An announcement section also exists so that professor and teaching assistants can make announcements easily. There are 15 data points that supported that professors and teaching assistants like to make mass communication easily. We also included a function that notifies students via e-mail when the professor makes an announcement. For the notification center, the user can decide what kind of message he or she would like to be notified of.

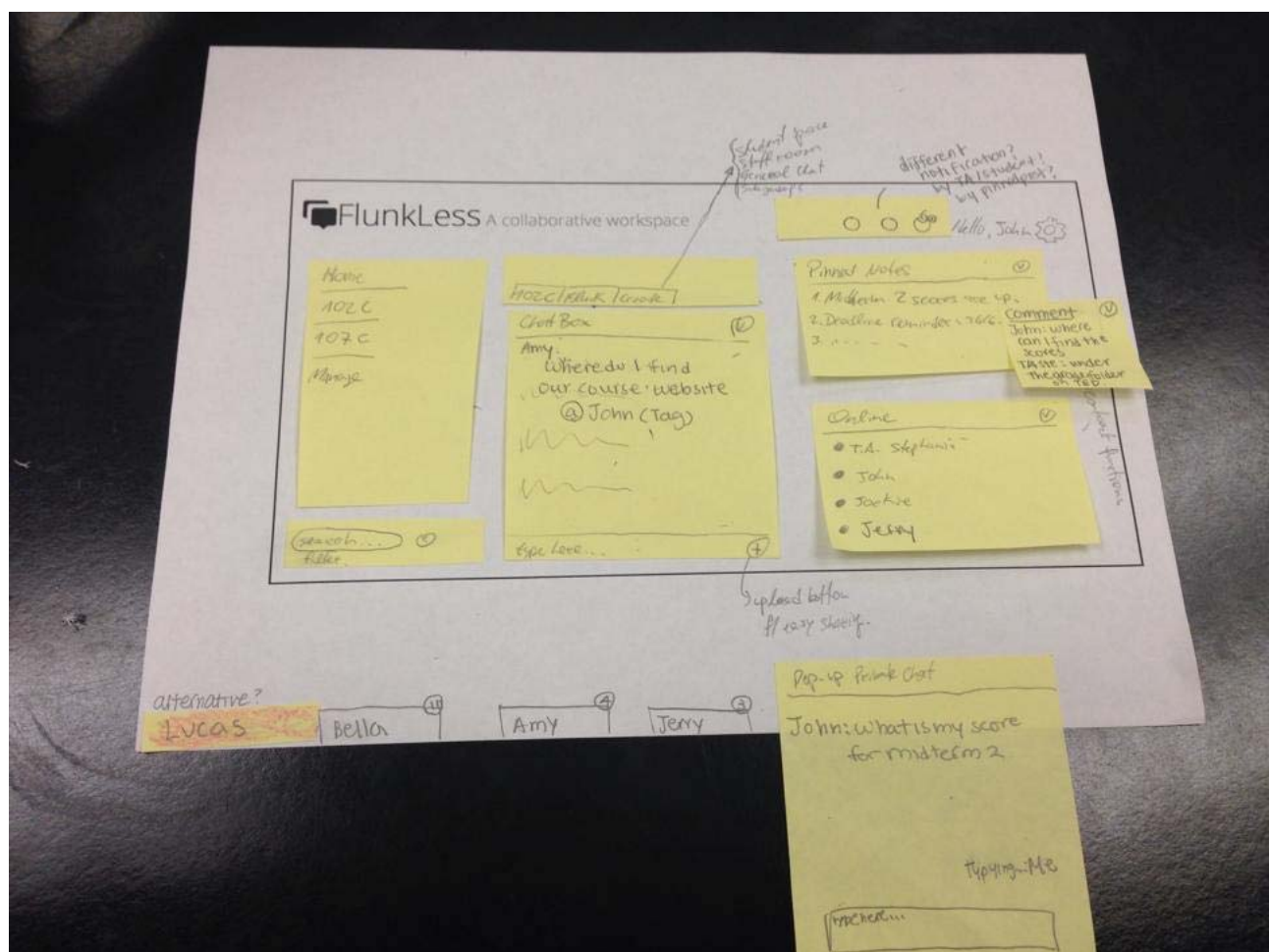


Figure 4 - Paper prototype of Chat Window

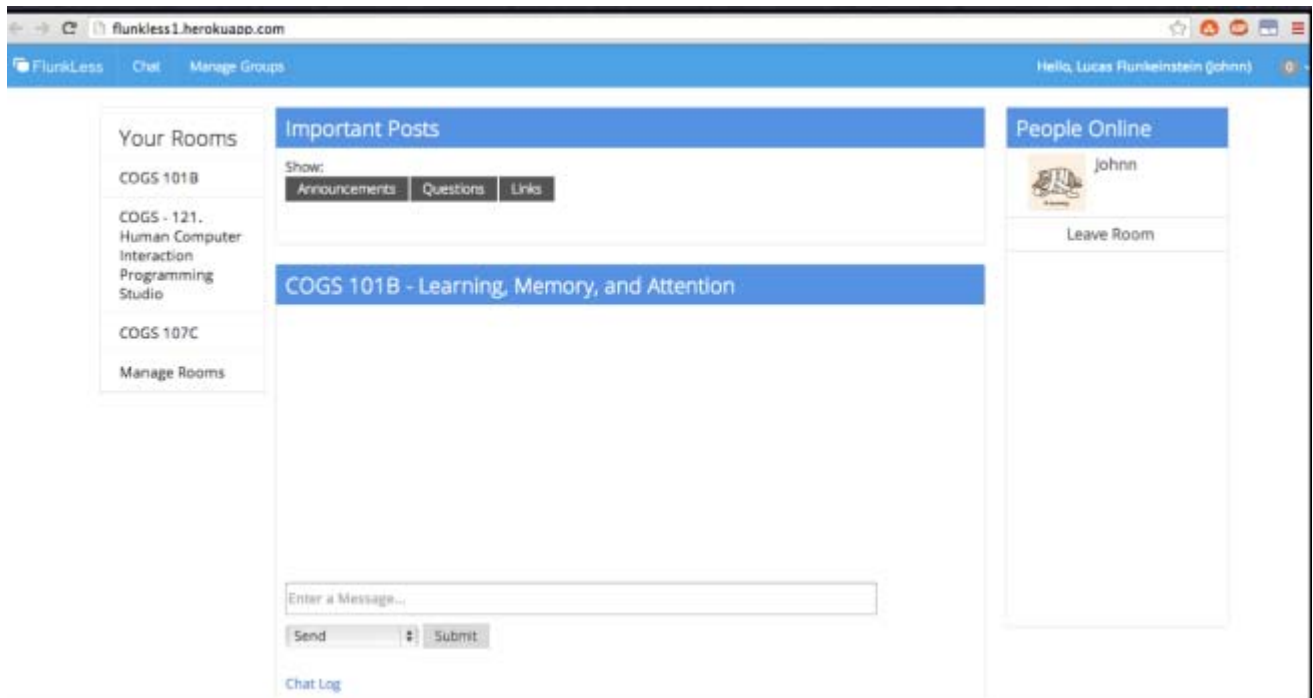


Figure 5 - Working prototype from COGS121 group

5. Paper Prototype Testing

5.1 Interview Process

Due to the time constraints, we were only able to conduct 6 prototype interviews (2 professors, 1 TA, and 3 students) using our paper prototype and I21's working prototype. For the prototype interview, we encouraged our users to think out loud as they navigated through. We asked clarifying questions about their expectations of our different functions such as group privacy settings, the different colors of the chat function, and the posting capabilities of professors, teaching assistants and students in a chat room.

During the paper prototype interviews, we encouraged the users to co-design the product by moving around the parts as they see fit. Because the working prototype did not allow for this kind of flexibility, we asked the users to simply indicate parts of the design that should be altered. We also gave the users a scenario to observe how they would accomplish certain tasks. For professors and teaching assistants we asked them to navigate through the website as if they were holding virtual office hours. For students, we presented the scenario as if they had a question to ask a teaching assistant. We first gave them our paper prototype to operate, and then we showed the users the working prototype from the COGS 121 student

group. During both, the users would begin at the home page and then proceed to attempt to complete the task.

5.2 Paper Prototype Interviews Protocols

We also created a list of protocols for our prototype interviews in order to look for more opinions and ideas about virtual office hours. However, this set of protocols is semi-structured, meaning it was still flexible for each individual situation. For full list of protocol questions, please refer to the binder tab#11.

5.3 Insights

After each interview, we conducted an interpretation session to gain insights and key issues presented by our users. Through these sessions, we created affinity notes to build a new affinity wall. We found out that there are many concerns about the low-level design. For the homepage, four out of six users were confused about the list of available classrooms. They did not know whether those are the classes they enrolled in or available chat rooms. Eight data points suggested that users would like to have a personalized homepage rather than seeing the large list of classes. TA01 suggested that she would prefer to hide those available chat rooms, and a student said that she wants the homepage to look more “fun”. Several users did not see the purpose of having “students room” and “staff room”. All users were confused about term “staff room”. For the working prototype, users are confused about the terms “manage rooms” and “manage groups”. P01 suggested that we rename “room” to “course” or “class” to prevent confusion; he wasn’t sure why it was listed as a “room”. He was also unsure as to what “pinned posts” meant (he drew an incorrect parallel to Pinterest). Fifteen data points showed that users have problem with the announcement section. Six out of fifteen data points suggested that users want a larger portion for the announcements while nine out of fifteen want a better way to categorize these posts.

For the high-level UI design, eleven data points suggested that users liked the function for having individual chat rooms with professor and/or teaching assistants (affinity diagram, section 2). However, thirteen data points stated that the users not see the purpose of using this platform. TA01 remarked that she did not think her students would use it. She believed that it would be extremely hard to motivate students to use this platform. The students stated that

they did not want to spend extra time to learn or use this platform for communication. They felt more comfortable communicating via email or attending office hours in person. Professors as well indicated a preference for face-to-face interaction over meeting virtually. In one of the interviews with a professor, our interviewer asked her, “What if you could use this platform during lecture?” The professor responded, “Then I’d use that in a heartbeat.” Taken together, the interviews made it clear to us that we were not quite on the right path. As Schon states, “The situation talks back, the practitioner listens, and [...] reframes the situation once again” (Schon, 1983). Thus, we decided to take on the role of reflective practitioners, reframe our data, and create new designs.

6. Reframing

To forge a new path, we needed a new framework from which we could see why the old idea did not work. To that end, we turned to the paper *Beyond Being There* (Hollan & Stornetta, 1992). In it, Hollan and Stornetta urges us to focus on the “needs, media, and mechanisms” involved in communication at large, rather than on trying to jam each new medium into a wanting facsimile of the other. For example, our proposed design idea of virtual office hours attempted to replace a medium (face-to-face) which already met the needs that office hours address and which was readily available to all. Should some conflict prevent a student from attending, for example, the virtual platform would likely be out of reach as well.

Thus we sought a genuine need that some other course medium did not already satisfy. The professor’s embrace of the idea to repurpose our platform for within lecture use provided that need. The current lecture structure, as mentioned at the beginning of this paper, allows one person to deliver information to hundreds of others at once, with only occasional pauses for questions from the audience. This format’s social structure resembles a star graph, or at best a near-wheel graph, if students feel comfortable asking those next to them for clarification.

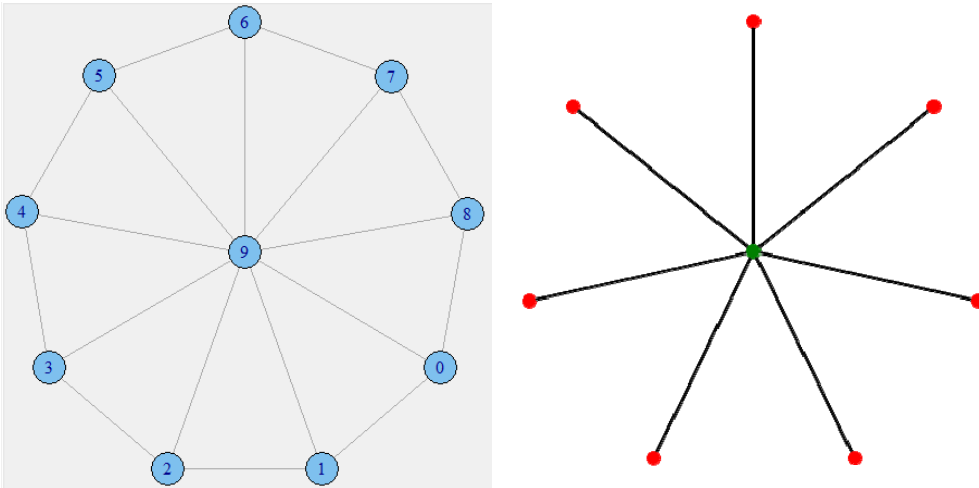


Figure 6 – Live information channels for each students, at most three; highly vulnerable to loss.

This can be problematic if students not only cannot follow the lecture but also cannot obtain clarification right away. As we've observed from several affinity notes from interviews, many students feel too intimidated to ask questions to their instructors directly. If a student does not understand a concept at the beginning of lecture, this may hinder their ability to understand subsequent topics mentioned in the same lecture.

With that in mind, we directed our efforts toward redesigning the FlunkLess medium to support in-class discussion, questions, and clarification to promote active engagement among students during lecture. When everyone, teaching assistants included, can participate in a silent meta-lecture, the power of group intelligence could be employed to resolve any confusion before it builds on itself.

To assuage social fears about asking a potentially embarrassing question, we recognize the advantage of anonymity that Hollan and Stornetta describes for text-based media. With e-mail, for example, he points out that people are more honest than when speaking face to face. In the case of lecture, then, the option of anonymity should provide a kind of social buffer that allows students to ask questions without fear (Hollan, 1992).

We further saw fit to preserve Hollan and Stornetta's advantages of archivability and "semisynchronous discussions" (Hollan, 1992). Chat messages can be archived, of course, but the linear (and somewhat chaotic) nature of a chat box with over one hundred participants will leave discussions of many different topics interspersed and difficult to wade through, something

that our data speak strongly against. Instead, we found that some kind of post-comment structure would be ideal. This would give the added benefit that a confused student could send out their question and promptly return their attention to lecture, until a response arrived.

7. Final Design

7.1 Focus and Flare

After reframing our focus, our final design shifted towards a system that could integrate the positives of what Facebook offered to our users and the new data that we received from our users after showing them our paper prototype designs. With our new focus in mind, we transitioned into a flare period in which we sketched countless potential design solutions. We then returned back to the focus aspect to create our final prototype which not only incorporates wall posts shown in real-time, but also additional functions guided by our data collected from users.

7.2 New Functionalities

The new features shall be discussed in accordance to the numbers shown in the figure below.

The screenshot shows the FlunkLess interface for the COGS102C Wall Space. The interface includes a header with the FlunkLESS logo, a user greeting 'Hello, John', and a search bar. A sidebar on the left lists 'My Classrooms' with options for COGS102C, COGS11, BILD18, CSE7, and an 'Add More' button. The main content area displays a feed of posts from users like Lucas, Bella, Jack, Alex, Amy, April, Nelson, and Nina, each with a comment count and a 'hide' button. On the right, there are two panels: 'Announcement' with a list of items (Lecture Outline, Guest speaker coming next Tuesday, I would like to hear ideas about context design) and 'Check-Points' with two questions (Q1: What is contextual design? and Q2: What can be used as a cultural model?) and a bar chart. At the bottom, there is a text input field labeled 'type here...' and a globe icon. The number of people online (93) is shown in the bottom right corner.

1. Text input field for asking questions.

2. Globe icon for navigation.

3. List of classrooms on the left sidebar.

4. Check-Points section on the right.

5. Announcements section on the right.

6. Filter by dropdown menu at the top right.

Figure 7 – The Wall Space with the 6 main features highlighted.

I. Ask Away

With the “ask away” function, our users have the ability to ask questions they may not have been comfortable asking in front of a large lecture as soon as they come to mind. This function was incorporated in our original designs; from our contextual interviews, users gave us an outstanding amount of data indicating that it’s hard to facilitate good conversations with your professors on TED or e-mail, because of the delayed responses. This function stems from people tweeting questions on TED talks. The “ask away” function will allow students to unburden their cognitive load and redirect their attention to the professor instead of holding questions in mind for later, which they often forget anyways. This wall space allows students to collaborate, ask questions, and also answer each other’s questions. Since it is a live feed,

professors can access questions and posts immediately *during* lecture and answer questions, so that students don't have to interrupt lecture entirely. The system also facilitated the lives of the TAs, who are usually sitting at the front of the lecture with their digital devices handy. Instead of having to waste their precious time logging into websites and answering the same question over and over, the TAs can address the student's concerns right away

2. Sharing

We maintained the easy upload button from our paper prototype, since we have seen a high demand for sharing materials in our interviews. This function allows users to attach files, links, or relevant material on the wall to share with their classmates. This function is not restricted to just peer-to-peer sharing; professors and TAs can also post and share on the wall space. There is an "attach" icon in the text box at the bottom of the wall to allow users in the specific class to easily share relevant information from common sites such as Google Drive, DropBox, etc. TAs supported the idea of being able to reach the class quickly and efficiently because e-mails are sometimes slow and non-responsive. With the sharing function, TAs and professors can share interesting articles or homework assignments. Sharing takes advantage of the fact that students browse websites during lecture and encourages them to engage and circulate knowledge between each other and their TAs and professors.

3. Voting

This function was driven by some of the interviews that we conducted. Facebook allows people to "like" a post which then makes it visible to others. Users said, "I like posts because I agree with whatever that person posted" (S04). Voting allows the students to have a more active voice in their education and it also provides instant feedback for the professor. We found that people often "like" a post to represent a digital accord to what is being posted. Our voting system stems from systems such as Reddit and Facebook. One teaching assistant stated that, "I have to keep scrolling down to find the important issues (TA01). This function allows professors and other students to see what most students are confused about and can promote a more flexible lecture in which the professor can take the time to address the confusion during class. Whatever is voted most highly shows a level of significance and moves to the top

of the page to make it more salient to users. Professors and students can use the voting system to gauge what needs to be reviewed or what is a general concern people are facing in lecture.

4. Checkpoints

This function is mainly targeted to professors and their intents. We see that professors enjoy teaching and gathering feedback, but it is relatively hard with large lectures and lack of tools to receive this information. Professors often want to pose questions to engage their students with the material and ensure their understanding, as mentioned by P01: “I want to know if my students actually attend lecture and understand the material that I’m teaching”. This feature helps the professor to improve their skills as instructor, for they receive instant feedback on students’ understanding of the material.

5. Announcements

This function is seen prominently on TED, a classroom management platform used by many UCSD classes. This functionality allows TAs or professors to post important information they want to relay to their students. We deemed it important to include this function for it is spoken announcements are often forgotten or missed by students who arrive late. In the case of class absences, students can see the important take-home messages mentioned in class or notable changes in syllabus etc. This functionality helps students keep track of their classes and stay up-to-date with everything.

6. History Search/ Filtering

Filtering is a systematic tool for users to use on a context-filled platform, such as FlunkLess. Users mentioned that “Piazza is cool, but lots of my posts get buried...(S02) ” and sometimes, “I’m just looking for specific things so I search keywords to find what I’m looking for(S04)”. The history search functionality is integrated in our system to allow for efficiency so that users can easily find lecture material, previously asked questions, announcements, and other details in the class. This ensures that even though there is a lot of information being circulated on FlunkLess, it is still accessible and well-organized. The ability to search through the history is helpful, will preserve a simplistic user interface, and keep the platform clean because only the most recent and highly voted posts will be displayed.

8. Competitive Analysis

8.1 Overview

Given the many options of learning and communication platforms users typically use during their daily lives, FlunkLess provides an integrated live communication platform for students, professors and TAs that is comparable, more user-friendly, and efficient. FlunkLess is a fast, easy, and secure communication and collaborative tool mainly useful for classroom settings. We took the functionalities users liked from competitors and incorporated in our platform allowing for maximum utility. For a closer inspection, we have selected several of our closest competitors to conduct an analysis.

8.2 Piazza

Piazza is one of our main competitors. Piazza is a learning management system where students can ask, answer, and explore any subject. Professors and TAs also have the ability to respond to questions on Piazza. Their website imitates a forum and allows for students to collaborate and ask questions. Our user data reflects that asking questions and receiving timely responses is a priority. Asking a question is difficult because our data shows that students are afraid or do not like interrupting lectures to ask questions. Piazza facilitates question asking *post-lecture* but professors and students are hardly on Piazza *during* lecture. We wanted to incorporate a live-feed functionality similar to group walls on Facebook, so that users can see immediate questions, concerns during lecture. This wall space allows for synchronous communication between students, TAs, and also the Professor. The professor would have FlunkLess opened up during lecture so that if students had questions during lecture it would pop up on their screen and they could address it immediately during lecture. This eliminates the issue of being afraid to raise your hand during lecture, forgetting their question later on after lecture, and receiving delayed responses. Piazza facilitates a platform for asking questions, but it's not a live stream and users found that sometimes their questions get buried down with all the other questions being asked and therefore remains unanswered. The voting system on FlunkLess eliminates this issue by having the priority system, which the important questions or the questions with the most concerns will not be buried.

8.3. TED

TED (ted.ucsd.edu) is a tool that UCSD students are extremely accustomed to as many classes employ this platform to organize course information. All of our users had prior experience using TED and generally showed disregard or some complaints towards it. TAs found it useful that they could make class-wide announcements, post grades online, and send emails to the entire class; however, the user interface is extremely frustrating. Students found TED something they “*had to use to download class material and keep updated*” (S02). Since the user interface was the main concern, we preserved the course information and document hosting function provided by TED and created Flunkless with user-friendly functionality, including commonly seen icons.

8.4 iClicker

The iClicker is a tool many professors prefer to use to gather feedback during lecture. This tool is very useful to gauge class participation and gain valuable feedback on how well the class understands the material being taught. The iClicker is a useful tool for immediate feedback in a class but has a few shortcomings. The iClicker is close to \$50.00, relies on a frequency system that needs to be installed in a classroom, and is limited to five buttons or options. This restricts the type of questions and only allows the professor to ask questions; it is a one-sided interaction. Professors emphasized the importance of participation during lecture and the desire to ensure the class understands the material so FlunkLess incorporated the feedback system by having a Checkpoint function on the site. This function allows the professor to ask questions periodically during lecture to measure participation and understanding, like iClicker, but it does not require an additional device, frequency system, and can allow for a more variety of questions (more than five choices, short answer, etc.).

8.5 Facebook

Facebook is a large social media tool that has grown exponentially and is used by almost all of our users. All our users expressed privacy concerns with Facebook and the fact that they want to separate their academics with the social life. Facebook is a great tool for collaboration because our data reflects that many students use Facebook to group chat, share files, schedule

meetings, or work on group projects together. Facebook has a group function that we liked and users seemed to find that an efficient tool, since they are usually already on Facebook and most people have Facebook accounts. We wanted to create an equally efficient website that allowed students to find students who were in their class and be able to collaborate together. FlunkLess provides the more academic and professional feel that Facebook cannot provide, since it is already branded as a social media tool, not an academic resource. FlunkLess also incorporates the functionalities of a wall space within a class, and students can see who is “online” and can chat with their peers.

9. Discussion

FlunkLess initially began as a Facebook app with a purpose similar to the web application, Basecamp, then transformed into a type of Google Hangout virtual office hours connected to Facebook, and finally transitioned into a digital supplement for the physical classroom itself. Students will be able to actively engage in lectures by being able to share “the living voice, the breathing form, the expressive countenance” of their instructors and fellow students (Newstok, 2013). In essence, with use of FlunkLess, students will be able to conclude the course with a much deeper understanding of the material.

The problem space FlunkLess decided to address, thanks to the Contextual Design process, was the lack of a coherent digital system to seamlessly link the classroom experience to the web. Just as Beyond Being There recognized the need to move beyond merely representing an experience in high definition (HD), FlunkLess sought to fill the needs, media, and mechanisms that the classroom experience needed to become richer and more accessible.

This shift in vision was accomplished due to the insights from previous attempts, the FlunkLess team’s flexibility and reflection, and the insights of our users.

The problem spaces addressed in the beginning of the process included communication between students and instructors, finding information easily as well as sorting it into interrelated categories, socializing between students, and intuitive usability. The first prototypes of FlunkLess came across as just another BlackBoard platform connected to Facebook. It was when interviewing a Professor that everything clicked when we were inspired to create a platform for in-class use, illuminating the untapped need for a digital support for the classroom itself.

According to Newstok, Massive Open Online Courses (MOOCs) have been designed to substitute the classroom itself, but in doing so removed the open-ended Socratic style of inquiry, a critical element to dynamic learning (Newstok, 2013). The human element in MOOCs displayed by the screen through a recording, is in fact removed from the experience of the learning itself. MOOCs teaching style is similar to watching a movie; viewers have no ability to participate in the content. Aside from MOOCs the web has been intertwined with the classroom for years.

Existing websites allow classes to share material and give students a space to ask questions, but none are designed to foster and support synchronous communication. This is where FlunkLess steps in; it would be the first website designed to give students and instructors a digital space “inside” the classroom itself. Students are unable to simultaneously ask questions anonymously or know what’s on the minds of others without the aid of digital devices but with FlunkLess, even the shyest student can share their thoughts with the same confidence as the outspoken students, allowing the classroom to return to an even more vibrant form of Socratic seminar where ideas are easily shared and developed.

FlunkLess will take advantage of the digital technologies students are already using to supplement class lectures. These technologies are neither good nor bad in themselves; some misuse technologies to further distract themselves from the lecture while others use it to facilitate understanding and note-taking. With a new layer of interaction that can be recalled easily, FlunkLess gives students a place to interact with class in a new way as well as return to the ideas and information captured therein for future reference. Rather than using devices to distract oneself from the lecture or just take down notes, students can interact with the class directly through synchronous discussions, sharing information, and responding to instructors.

10. Future Direction

So, where to next for FlunkLess? First, it needs to be prototyped in an active lecture to see what the users actually do with the platform in the context of the classroom. Here are a few questions FlunkLess will need to address: How actively can a professor follow FlunkLess as well as their own lecture plan? How can an instructor best interact with the system during lecture? Will this system improve student performance or prevent them from paying attention? These questions, and many others, can best be answered through an ethnographic

study of active use. The data from an ethnographic study will make it possible to clearly understand user statistics in addition to refining the user experience design. If FlunkLess could include predictive algorithms based on user statistics it could offer useful recommendations based on class size, materials, etc. For example, FlunkLess could recommend a specific point during lecture for the professor to ask for student feedback based on the student activity in the individual class plus statistics regarding class content.

The design of the user interface could allow many options for the use of FlunkLess in the classroom such as syncing FlunkLess to class slides like iClicker and providing the instructor with software that allows them to concurrently present material while keeping track of student activity. Integrating quizzes & tests could allow instructors to easily give, grade, collate responses that could give instant feedback to the class. Anonymity on FlunkLess is another function to explore; our users have various opinions on this issue. Incorporating other aspects of the class, such as grades, finals, projects, and essay submissions are all on the table to be explored by FlunkLess. In the end FlunkLess can transform the classroom from a lecture space into a collaborative investigation space where ideas and experiences are explored freely and collectively; it will allow for a more dialectic relationship between the lecture and student.

II. Acknowledgments

We would like to thank Professor Jim Hollan and the rest of his teaching staff for providing us with opportunities and guidance. Thanks especially to Melody Kim for her valuable feedback on our ideas and presentations. We would also like to thank all of our users for participating in the interviews. Thanks to our COGS121 teammates, Alex Yang, Thomas Ahn Nguyen and Kandice Wong, for implementing a working prototype and sharing ideas. Finally, the experience of working on this project would not be the same without the competition. So, thanks to all of our COGS102C classmates for challenging and inspiring us!

12. List of References

- Hollan, Jim. "Lecture 5." Cognitive Science 20C. UC San Diego, La Jolla, CA. 15 Apr. 2014. Lecture.
- Hollan, Jim; Stornetta, Scott. *Beyond Being There*. Computer Graphics and Cognitive Science Research Groups Bellcore, CHI 1992 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. Accessed on ACM digital library on May 15 2014.
- Holtzblatt, Karen, Jessamyn Burns. Wendell, and Shelley Wood. *Rapid Contextual Design: A How-to Guide to Key Techniques for User-centered Design*. San Francisco: Elsevier/Morgan Kaufmann, 2005. Print.
- Newstok, Scott L. *A plea for "Close Learning"*. Association of American Colleges and Universities. Fall 2013, Vol.99, No.4. Accessed on May 19 2014.
- Schön, Donald A. *The Reflective Practitioner: How Professionals Think in Action*. New York: Basic, 1983. Print.