DEVELOPING A SOCIAL NETWORK TO INCREASE INVOLVEMENT IN A COMPUTER SCIENCE ACADEMIC COMMUNITY

by

Kolten Robison

A thesis submitted to the Faculty and the Board of Trustees of the Colorado School of Mines in partial fulfillment of the requirements for the degree of Master of Science (Computer Science).

Golden, Colorado

Date _____

Signed: _____

Kolten Robison

Signed: _____

Dr. Tracy Camp
Thesis Advisor

Signed: _____

Dr. Cyndi Rader
Thesis Advisor

Golden, Colorado

Date _____

Signed: _____

Dr. Atef Elsherbeni
Professor and Head
Department of Electrical
Engineering and Computer
Science

ABSTRACT

In order to address a lack of involvement and participation by computer science (CS) students in their academic communities, CS CONNECT, a social networking site for the computer science students at the Colorado School of Mines, aims to increase interaction between students and strengthen their sense of belonging to a community. Students that develop a stronger sense of community within the CS academic environment tend to have higher completion rates in CS programs [1]. This thesis focuses on further development of CS CONNECT, in order to give it more aesthetic appeal, as well as to introduce new features that may have a positive impact on site usage. It remains unclear whether CS CONNECT directly influenced students' feelings of the CS community; however, motivating methods and features were shown to have an impact on site participation and content contribution.

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ACKNOWLEDGEMENTS

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CHAPTER 1

INTRODUCTION

Computer science has long been a field in which women are severely underrepresented, even when compared to degrees in other STEM fields [2] [3]. In addition to the low percentages of female graduates when compared to other STEM fields (Figure 1.1), the number of Bachelor's degrees awarded in Computer Science have become *increasingly* one-sided in recent years, falling nearly 20% from 1980 to 2010 (Figure 1.2*)*.

Research indicates that networking encourages participation of women in computer science by helping to overcome unfamiliarity with the subject and by increasing interaction with their peers [4]. Networking may also occur via online social websites. This thesis explores the use of a social networking site developed specifically for use by CS students.

1.1 Background

To address the lack of community and feelings of isolation that may contribute to low participation of women in computer science, a number of conferences (e.g., Grace Hopper Celebration for Women in Computing) exist to encourage networking among female students and professionals. The CONNECT (Creating Open Networks aNd Expanding Connections with Technology) system was developed to encourage interaction between conference participants [5]. When deployed at Grad Cohort 2013, the CONNECT tool had a significant impact on networking and allowed many women who did not know how to effectively network to make relevant professional connections

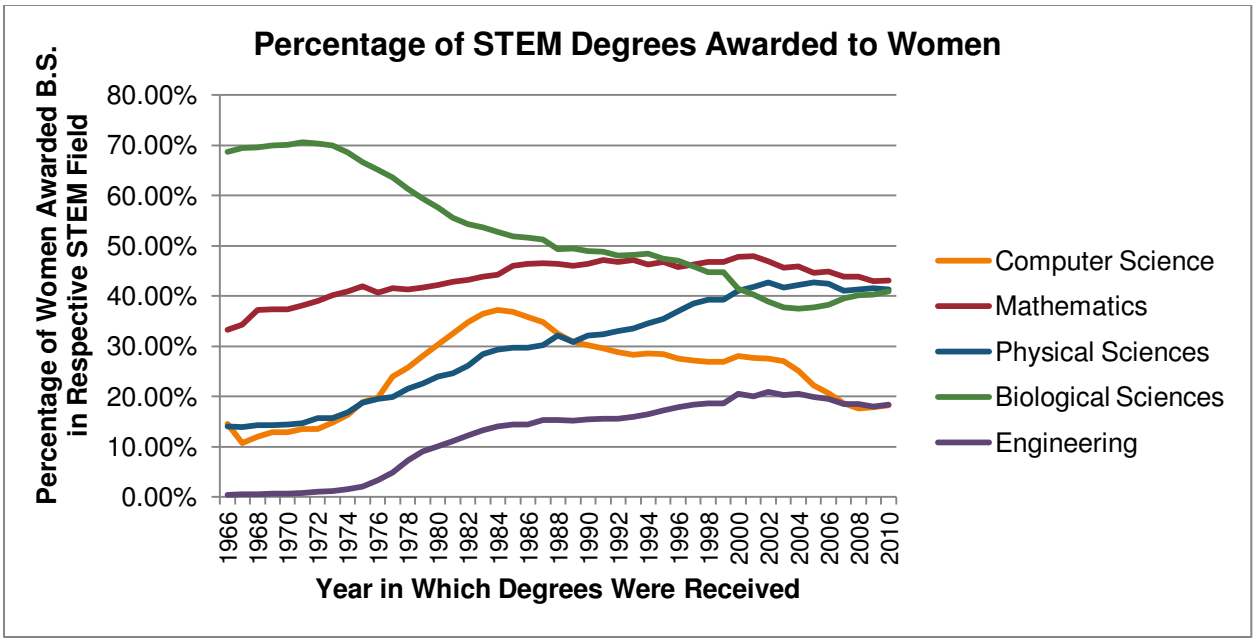


Figure 1.1 - Data from the National Science Foundation comparing the trends of gender representation in various STEM fields.

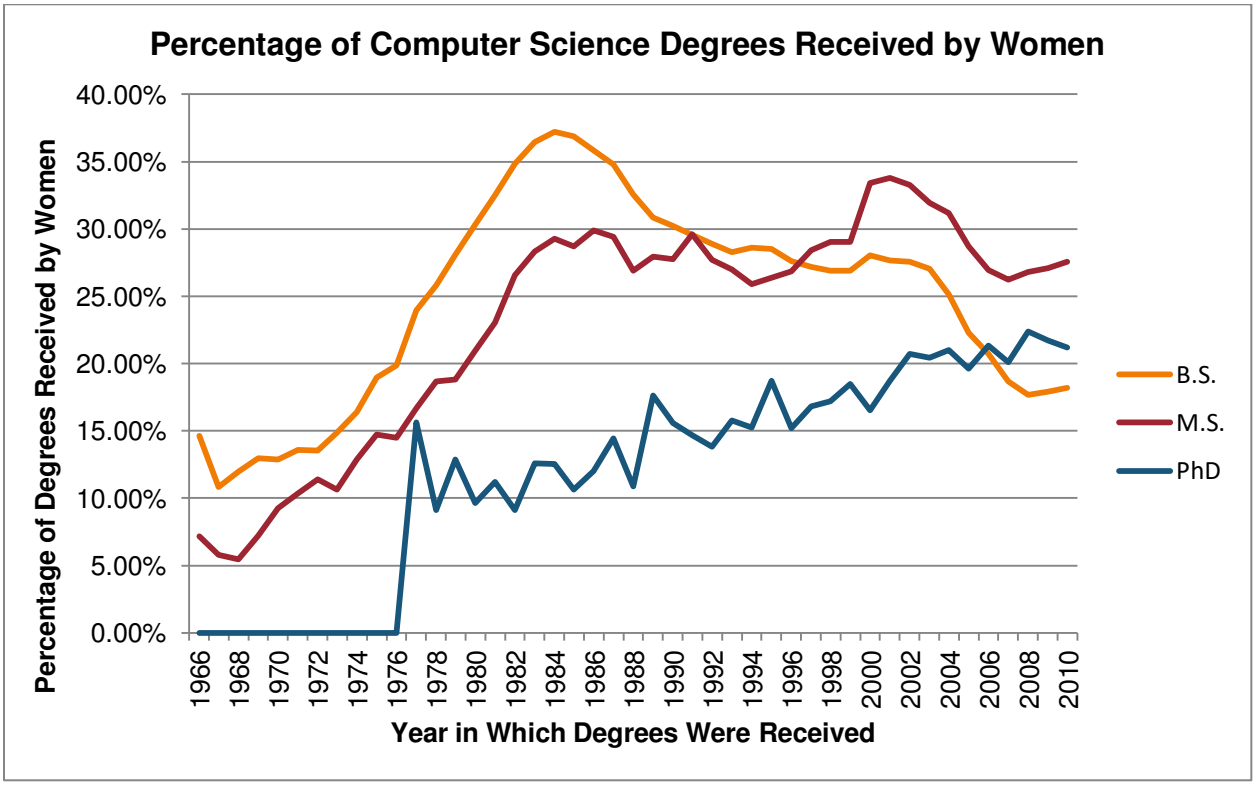


Figure 1.2 - Data from the National Science Foundation showing the percentage of women with various degrees in Computer Science over time.

and increase self-confidence in networking ability [5].

CS CONNECT applies the principles behind CONNECT to an environment for students studying computer science at Mines. CS CONNECT is a social networking site designed to broaden participation in computer science by increasing community awareness and participation in departmental activities.

The first version of CS CONNECT was developed and deployed by Thomas Brown during the 2013-2014 academic year. Survey data from the first iteration of CS CONNECT showed that there was a small increase in networking attitude over the course of the site's deployment, but it was inconclusive as to whether or not CS CONNECT was responsible for these changes. The lack of ability to pair a user's answers from the post-survey to the pre-survey made it increasingly difficult to have confidence in survey results. In addition to this, research findings were limited due to small sample sizes, a short period for data collection, and very limited site usage.

Clearly if students are not using an online social network it will have limited impact on feelings of community. To address this issue, the site has been redesigned to be more aesthetically pleasing; in addition, less popular features were removed and new features were added. Site modifications are described in detail in section 4. To address issues with data collection, CWIDs (Campus Wide IDs) are used to pair survey results, and usage data was collected over a longer period of time.

1.2 Goals of Research

The research proposed for this thesis expands upon the study conducted on the CS CONNECT platform. By redeploying the site throughout the CS community at the

Colorado School of Mines and collecting data via surveys to analyze the effects of site usage, the goal of this thesis is to explore the following questions:

- How do students use CS CONNECT?
- Will usage of CS CONNECT have an effect on users and their sense of community?

Specifically, we focused on which features were used and what factors impacted usage of the site. Factors that we hypothesized would have an impact on site usage and user contributions include improved aesthetics and the introduction of competitions.

CHAPTER 2
LITERATURE REVIEW

Research relevant to the goals of CS CONNECT falls into two main categories. First is research on the involvement of underrepresented populations in the computer science community and their motivation to pursue or complete a computer science degree. The second category concerns user retention on social media and motivation behind content contribution to social networking applications.

2.1 Motivation to Pursue Computer Science

Many studies have been conducted regarding why women are underrepresented in computer science. A study at the University of Virginia identifies two major factors for a women deciding to major in computer science. The first is having friends and family who support their decision to major in CS. The second is the perception that CS offers a creative outlet [6]. Similarly, for underrepresented students, encouragement from peers has proven universally successful in student retention across STEM fields. Specific to computing, the study found that women tend to leave such programs at higher rates than men, but that promoting interaction with peers in computing helped to encourage women to continue pursuing their degree [6].

A study from Deakin University shows that women in computer science typically enjoy the work that they do, but complaints arise from a lack of female peers [7]. A main goal of CS CONNECT is to provide peer support for students at Mines. By giving female undergraduates who are in or considering going into computer science the opportunity

to interact with and meet one another, CS CONNECT seeks to promote encouragement and support from peers and instill users with a sense of belonging to the CS community.

Broadening on this perspective, research suggests that many students who may have an aptitude for computer science are discouraged from majoring in computer science because of a general lack of knowledge of computer science and public misconception about computer scientists [8]. The study suggested that an overwhelming 80% of high school graduates had "no idea" what a computer science student learns, and that most students consider computer scientists to be antisocial people who "spend all day sitting in front of a computer" [8].

2.2 Social Network User Retention and Contributions

Regarding social networking, research supports the motivation behind CS CONNECT, i.e., interacting through a social network can help users form meaningful and lasting connections with other users [9]. The same article shows that the largest motivator for using a social networking application is to connect with new people. Research also supports the idea that social interactions via an online platform allows for more anonymity and an increased ease of communication with others which promotes networking [10]. A study conducted on Michigan State University students indicates that the social capital formed by using social networking sites such as Facebook helped to increase the students' feelings that they were a part of the MSU community [11]. Another study showed that extrinsic reinforcements like physical gifts, social recognition, and feedback from other users provided additional motivation for a user to contribute to online communities [12].

A main concern when implementing a social networking system in a new environment is how to motivate users to actively participate and contribute content. A study from Carnegie Mellon University of about 140,000 new profiles on Facebook identified the primary motivations for new users to contribute content, as well as potential roadblocks that new users face when joining a social network [13]. The study showed that new users are not initially inclined to share content due primarily to the risk of being 'singled out' for their contributions by their 'friends' on Facebook. However, the study also showed that 'social learning' occurs for new users of Facebook, meaning that users become much more likely to contribute content of their own after seeing their friends contribute. Another factor behind motivating new users to contribute content relates to receiving feedback and having a wide audience [13].

It is also useful to understand the motivation behind user contributions when there is no defined benefit to the user for contributing. For example, why would a user share their knowledge on a crowd sourcing website like Stack Overflow if the user does not directly benefit from this and could merely utilize the site for their own questions? According to a study from Florida State University, the main reason for a user to contribute content that is primarily for the benefit of others is to enhance the user's professional reputation [14].

A feature of CS CONNECT that requires user content is the CS Challenge question, which allows users to answer challenging questions about computer science. A study at CMU found that users were more likely to contribute answers to questions that were specific, challenging, and reminded the users of their uniqueness. For example, easy questions or questions that include words such as "do your best to"

would be much less appealing to a user than challenging questions. The study also showed that emailing users to remind them of an opportunity to contribute was extremely effective in generating increased user contributions [15].

CHAPTER 3

DESCRIPTION OF THE CS CONNECT SYSTEM

CS CONNECT is designed to allow computer science students to practice their programming skills in preparation for interviews, share content they've created with a community that can critique and enjoy the content, and learn about the other students at Mines pursuing a degree in computer science. The first section in this chapter describes features of CS CONNECT that were retained from the original site, while the second section describes new features and other modifications.

3.1 CS CONNECT Features

The home page for CS CONNECT is the newsfeed (Figure 3.1). On the left side you can see post filters that allow users to display only content that is interesting to them. The right side contains inline post content. This is also the page where a user can submit new content for others to view, using the "New Post" button at the top of the newsfeed.

Each user has a profile page, which contains a section with customizable information, as well as a list of all of the posts that the user has made (Figure 3.2). Information at the top of the page gives users a quick impression with a user-submitted "Profile Picture" as well as the degree and graduation date of the user, so that other users may quickly determine how much they have in common with the person whose profile they are viewing.

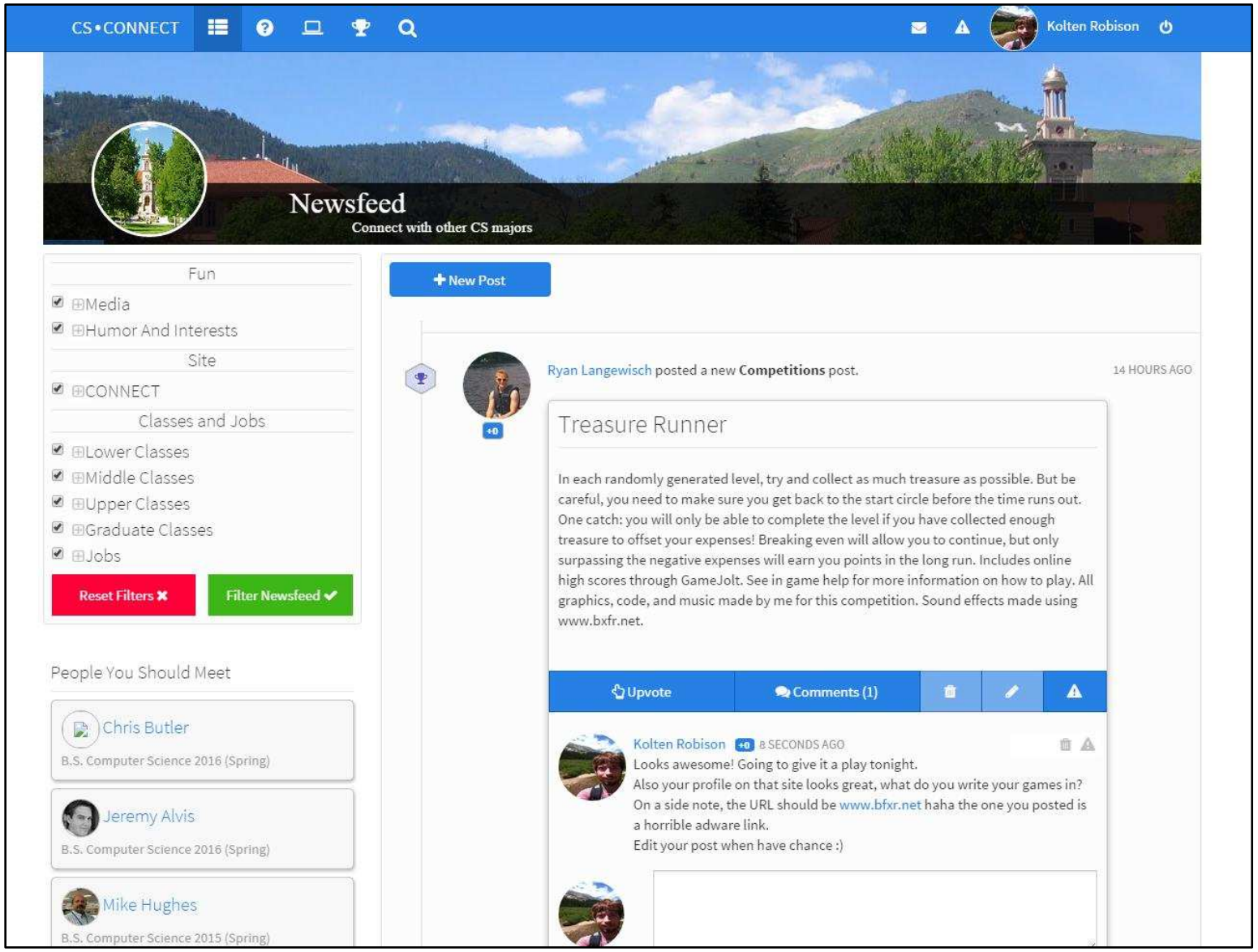


Figure 3.1 - The newsfeed page with content visible. Filtering options are on a page sidebar.

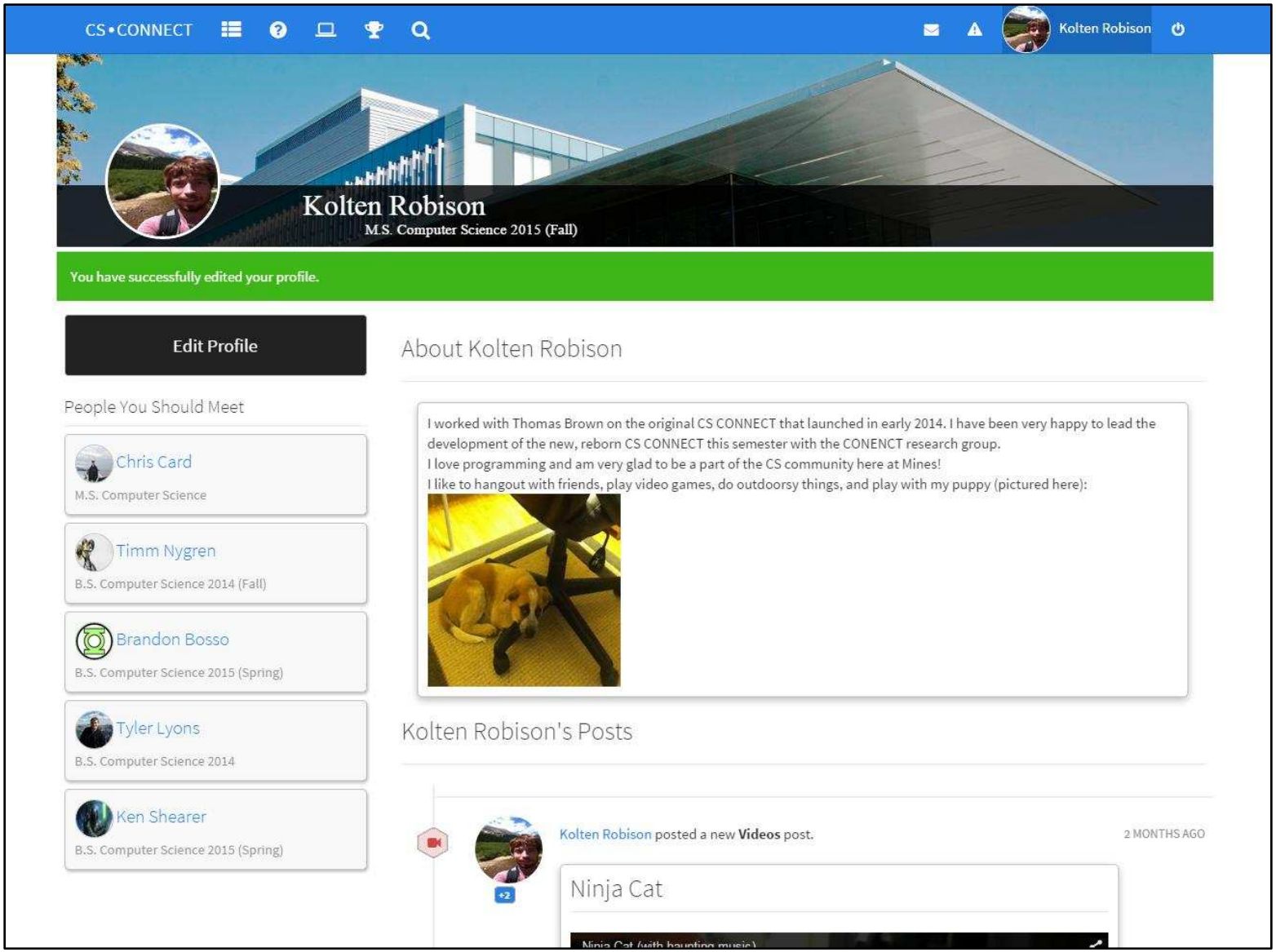


Figure 3.2 - An Example profile page on CS CONNECT.

The CS Challenge Question is a returning feature where users are given programming questions to answer with the incentive of winning prizes (Figure 3.3). This feature was popular among users in the first version of CS CONNECT. New questions are posted weekly by the site administrator.

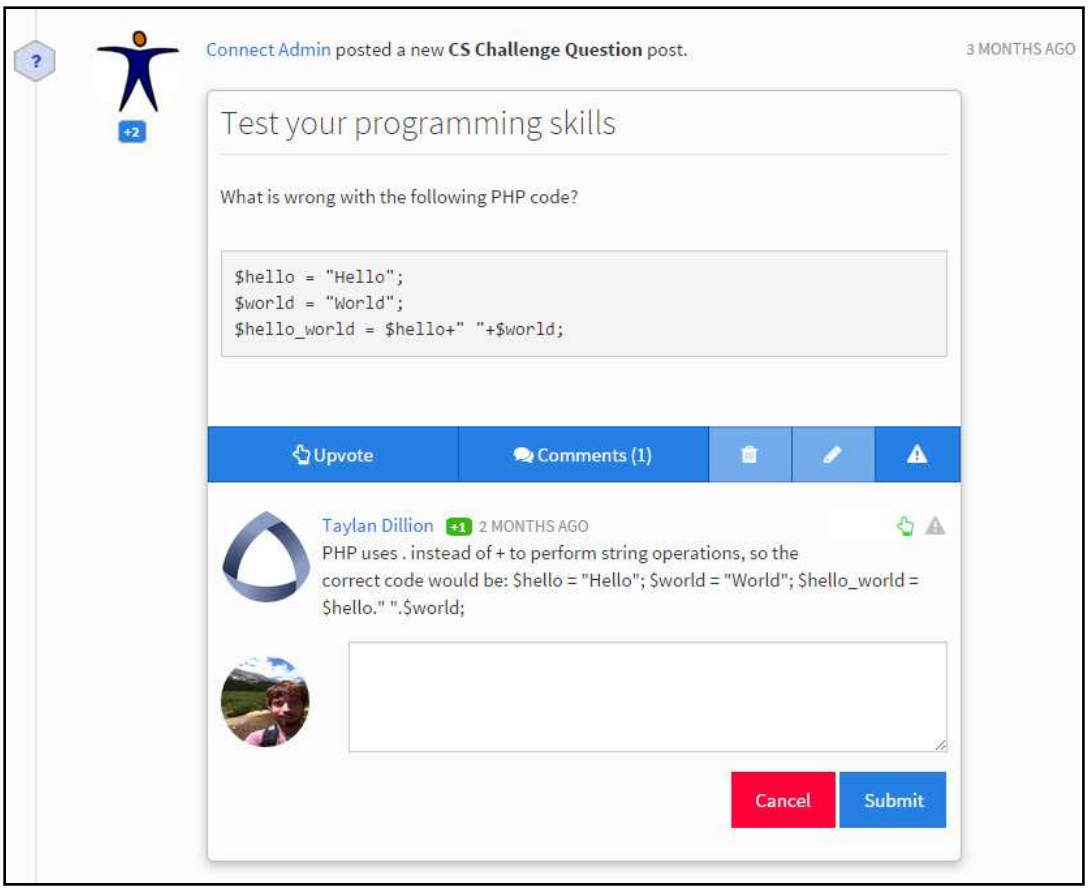


Figure 3.3 - The CS Challenge Question with a sample question and answer.

In the Projects feature, users can post their own CS content to share with site users (Figure 3.4). The content can be a file to download (e.g., a game or application), or a link to a website where the user has posted a web application.

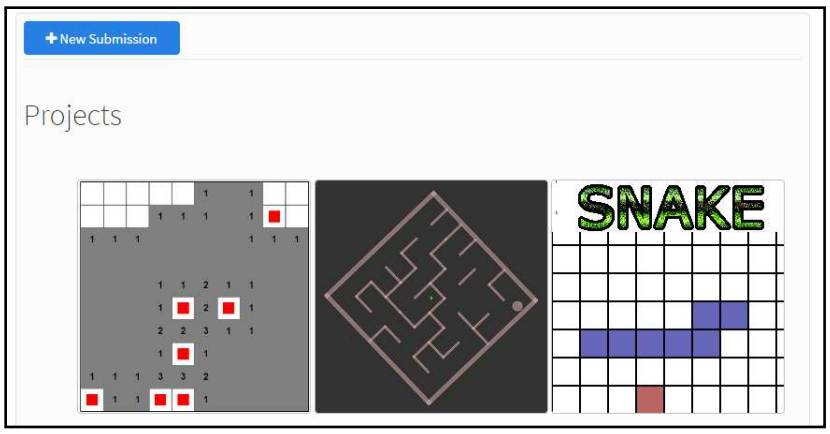


Figure 3.4 - The projects page displaying three example submissions.

3.2 Overview of Changes

While planning the redesign of CS CONNECT, we identified four main areas of concern to address from the original site. First, student reviews of the site aesthetics indicated that the site was poorly organized and difficult to navigate to access content. Second, some of the features of the site were underused and rated poorly by users. Third, the original site lacked motivators for users to contribute content. Finally, it was difficult to discover users who had not already posted content.

The new site was built from the ground up, with a complete change in site layout and content organization. The new layout was meant to increase screen real-estate for user content and reduce screen usage by navigation features, while at the same time providing a more user-friendly and accessible navigation. This was achieved by using an anchored top-of-the-page navigation bar with only simple pictures rather than words, and vastly increasing the width of the content area by adding some features to a second column on the left side.

To promote content contribution, the newsfeed was updated with the ability to have content and comments in-line. In the previous system, a user had to navigate to a new page to view the full content of a post. In the current version, comments are displayed in-line with the posts, which can also have in-line elements such as YouTube videos to enhance and simplify browsing (Figure 3.5).

One main feature that has been added to the site is the ability to host content competitions (Figure 3.7). Competitions allow users to compete against each other by submitting content that can be viewed and voted on by other users. Studies have shown that new users are often reluctant to contribute content to social networking sites [13]. The unique competition prompts and possibility of winning prizes from competitions is intended to offset this effect.

Another new feature added to CS CONNECT is "people you should meet" (Figure 3.6). This feature creates a list of people that is displayed on the left of the website. The list contains links to profiles of randomly selected students with the intention of encouraging users to interact with and meet new people in computer science as well as connect with people the user has limited familiarity with. The users' graduation degree and year are shown so that a target user may identify users that may have overlapping social experiences. Clicking on a link allows the user to go to the person's profile to learn about the person from their bio. The profile page also contains a button that allows users to send messages to the displayed user.

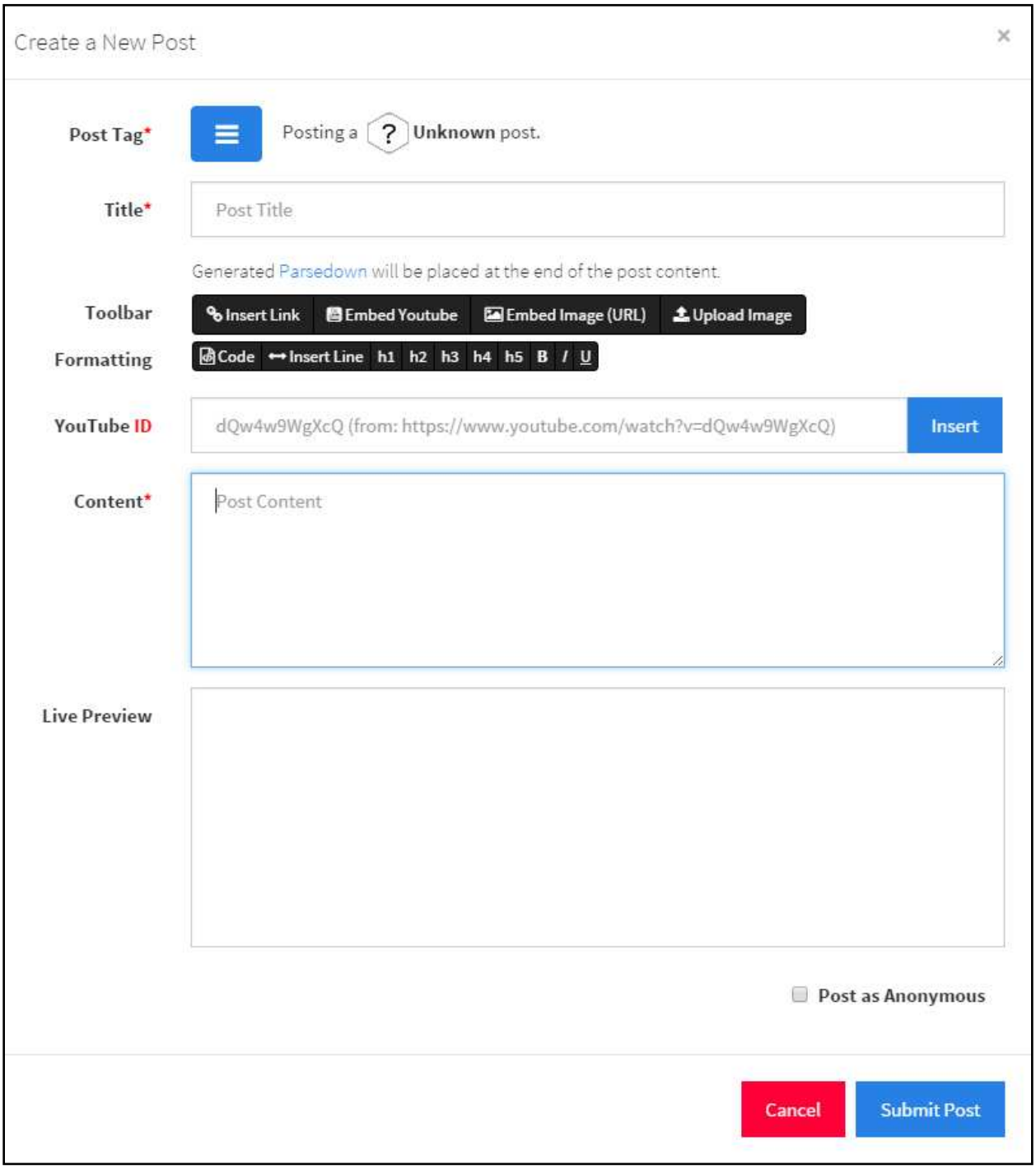


Figure 3.5 - The dialog to submit a new post now includes a variety of formatting and media embedding options.

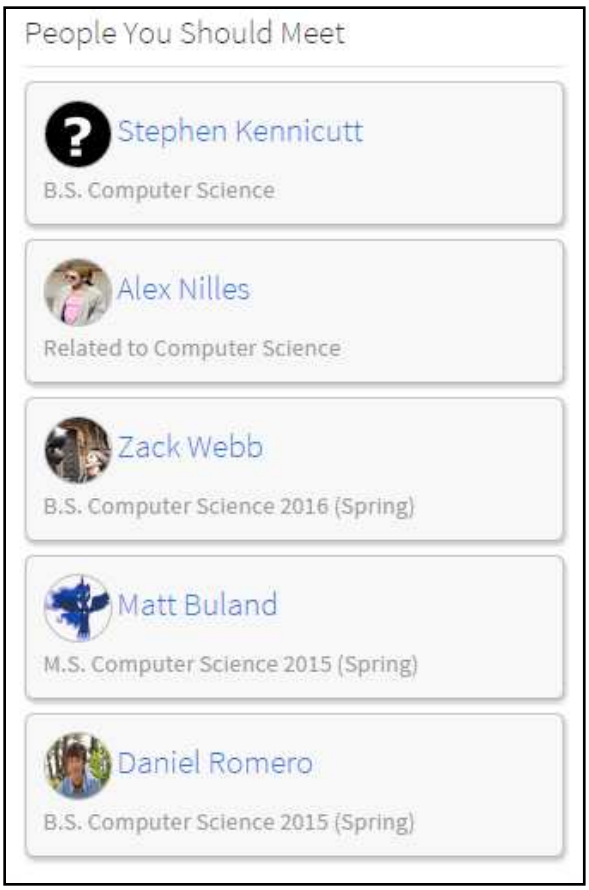


Figure 3.6 - Suggested users for interaction via "people you should meet"

Figure 3.7 An in-progress picture taken of a competition and its submissions.

CHAPTER 4

RESEARCH METHODOLOGY

In this section, we describe the methods used to obtain data and how to relate the data to research questions. We also describe content creation by site administration to increase site content and promote participation.

4.1 Data Sources

Data collection was from three sources: site usage data, student surveys, and a focus group. We discuss these data sources in this section.

4.1.1 Site Data

To track site usage, all user interactions with the CS CONNECT system are saved in a database log. Interactions include a user logging into the system, viewing the profile of another user, sending a message, or commenting on a post. Each event can by identified by its corresponding website route request. Log entries consist of a timestamp, user ID, an event name, which person the user is interacting with (if applicable), and entered field data. Different usage paths are distinguishable from each other from the logs (e.g., Profile clicked from "people you should meet" is different from clicking a profile in post comments). Data from logged events is stored into a mySQL database where it can be retrieved and analyzed. Events enable accurate reporting of the frequency that users access each part of the site.

4.1.2 Survey Data

Two student surveys that were completed during class are another main data source. These surveys assess how well students know their classmates and how well

students fit into the Mines CS community (see appendix A). Although a number of surveys can be found that address the sense of community in various contexts, such as online classes [16] and within different cultures [17], we are not aware of any validated surveys that match the goals of this study (i.e., sense of community within a computer science department). Survey questions were, therefore, developed via brainstorming sessions with the faculty advisor. The resulting surveys provided valuable input for this formatives research study. Future iterations of this research, however, would require a more disciplined survey approach.

Surveys were conducted in a pre/post format so that results could be compared over time. The pre-survey was conducted in October 2014, just prior to the initial deployment of the site. The post survey was conducted in April 2015, close to the end of the semester (and the corresponding conclusion of data collection). Question topics included:

- How well students know their classmates.
- How easily students meet other students in their major.
- How isolated students feel in their majors.
- How important belonging to a community is.

The post-survey also included a section to collect feedback about CS CONNECT features (see appendix B). The final section of the post-survey gathered students' usage patterns and preferences related to social media (appendix C).

4.1.3 Focus Group Data

To obtain data regarding the site aesthetics, a meeting was held with a small focus group. The plan was to gather about 5-10 volunteers, primarily female (as the

target audience), to ask questions related to the visual appeal of the site. To reduce potential bias, the role of the researcher would have been to take notes, while a second graduate student would have performed a semi-structured interview, asking participants to compare three different systems (the original CS CONNECT, the revised CS CONNECT, and the successful version of conference CONNECT used at a workshop for female graduate students).

Due to the heavy workload experienced by most students toward the end of a semester, we were only able to recruit two volunteers. The focus group protocol was then modified so that the primary researcher both asked questions and took notes.

4.2 Contribution Motivation

In an attempt to increase usage and encourage content generation, we posted news items (e.g., job opportunities and job interviews tips), hosted several competitions, sent emails to registered site users, and posted challenging interview questions as CS Challenge Questions. We discuss these motivators in this section.

4.2.1 Competitions

A total of four competitions were hosted through CS CONNECT during data collection. The first was a winter games competition that started on December 15th, 2014 (the start of winter break) and concluded February 2nd, 2015. The purpose of the winter games competition was for students to design and program an original game and to share their creation with other students. The next competition was a humorous post competition. Running from February 17th to March 6th, the humorous post competition was to encourage users to share content on the site newsfeed by offering a reward to the humorous post with the most upvotes during the competition span. The next

competition, the CSCI 306 (*Software Engineering*) competition, ran from April 22nd to April 26th and allowed CSCI 306 students to play and rate each others' final project submissions. Finally, a high scores competition was held, where 6 games from previous JavaScript game submissions in CSCI 445 (*Web Programming*) were modified to interact with a high scores API (Application Programming Interface) via CS CONNECT. The API allows users to record high scores while playing games that use the API, and for the high scores to show up in the competition submission pages, as well as user profile pages. This competition, running from April 27th to May 8th, allowed users to consume user-generated content and compete against their peers for high scores.

4.2.2 CS Challenge Questions

CS Challenge Questions were posted periodically throughout the data collection period of CS CONNECT. Ten questions were posted over the course of Spring 2015. Challenges were chosen from top interview questions in an effort to motivate students to prepare for technical interviews by attempting to solve the challenge questions.

4.2.3 Emails

Emails were sent periodically to announce site changes or updates, promote competitions and challenge questions, and to publically congratulate the winners of competitions. Emails contained direct links to parts of CS CONNECT for quick access to the site or particular features in an effort to increase site traffic.

4.3. Methodology Table

Table 4.1 - Methodology table that maps data sources to specific research questions. The table is separated by major thesis research questions.

Research Methodology	
How do students use CS CONNECT?	**Account Analysis - Who is Using CS CONNECT?**
	Query the 'users' table in SQL database to determine the total number of accounts and to group them by degree, graduation year, and gender.
	Site Usage Analysis - How are users using the site?
	Analyze logs to determine how often users accessed different site features.
	Create content timeline - How do content motivators impact content contributions?
	How many users contributed projects to site competitions?
	How many users viewed user-contributed competition content?
	How often were answers posted for the CS Challenge Question?
	How often were job interview tips viewed or commented on?
	Content Analysis - How often do users contribute content and what kind of content is contributed?
	Use event logs to determine what types of content were shared (e.g., videos, pictures, humor posts) and correlate to usage driving factors (e.g., competitions, emails).
How does usage effect students?	**Survey Analysis - Did usage affect students' sense of community?**
	Users will be compared on a 1:1 basis via anonymous Campus-Wide ID (CWID)
	Answers will be correlated with site usage to determine whether or not usage of CS CONNECT may have impacted students' sense of community and feelings about their major and peers. Only users that used CS CONNECT were included in the pre/post analysis.

CHAPTER 5

RESULTS

This section includes the presentation and analysis of data collected from CS CONNECT in order to explore our underlying research questions. First, we present details about user demographics collected from site logs and surveys to lay the foundation for the rest of the analysis. Then, we investigate any potential effects that site usage had on a user's sense of community. Lastly, we describe and analyze site usage statistics and identify key motivators behind site usage.

5.1 User Demographics

CS CONNECT launched in November 2014 and was online through the end of May 2015. At the end of Spring 2015, CS CONNECT had 194 registered users. Table 5.1 shows a breakdown of the site users by different user-provided demographic information. Table 5.2 shows the demographics for the pre-survey (October 2014) and post-survey (April 2015). These surveys were conducted during class time in CSCI 262-*Data Structures*, CSCI 306-*Software Engineering*, and CSCI 400-*Principles of Programming Languages*. Site users contained more postgraduate students than survey takers due to surveys only being targeted at undergraduate courses; survey takers were nearly all seeking their bachelor's degree, were primarily sophomore, and included a much higher percentage of non-CS majors due to a large number of students in CSCI 262 being surveyed.

Figure 5.1 shows the growth of site accounts during the Spring 2015 semester. The site had about 20 new accounts per month at the beginning of the semester, which

slowed to a rate of about 10 new accounts per month by April. The sudden 80% increase in new user accounts in late April can be attributed both to (1) the introduction of a class-based competition in CSCI 306, and (2) registration for CSCI 370-*Advanced Software Engineering*, which was handled through the CS CONNECT site and required a site account.

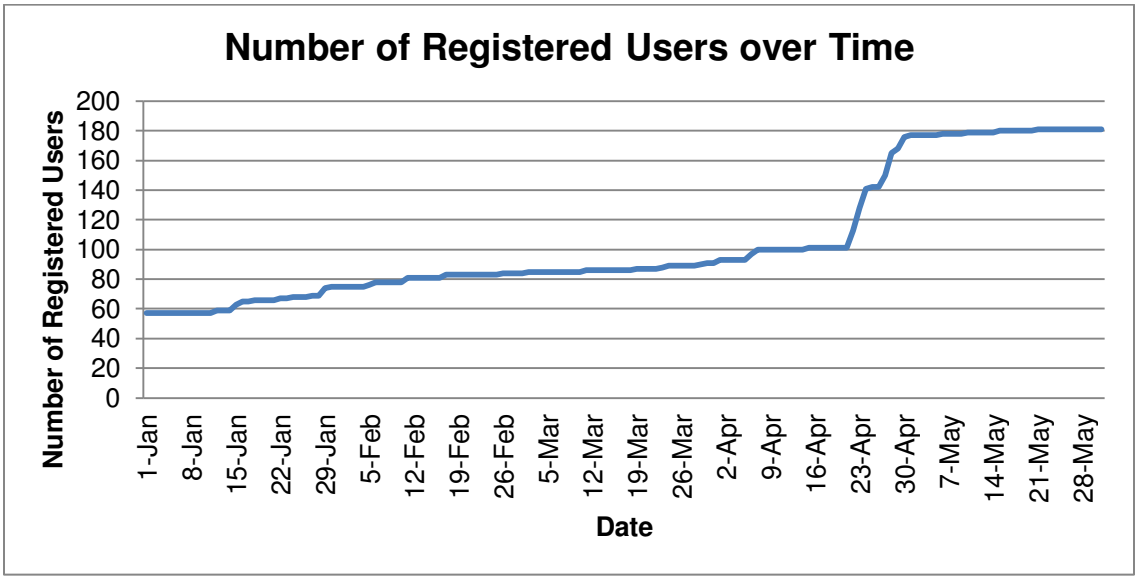


Figure 5.1. Number of registered user accounts for CS CONNECT over time.

5.2 Pre-Survey

A survey was given to 193 potential CS CONNECT users, shortly before the site was deployed. The survey was targeted at students in CSCI 261, CSCI 262, CSCI 306, and CSCI 400 in an attempt to cover a wide range of computer science students; a survey link was given during class time along with time to answer the survey being provided. The survey helped to identify students' preconceptions of social media as well as how they felt about their academic community. One purpose of the pre-survey was to determine if there is a desire for students to be a part of a community, and thus a need

Table 5.1. Demographic information collected from site users.

Trait	*Amount*	*Percentage*
Gender		
Male	154	79.38%
Female	31	15.98%
Unspecified	9	4.64%
Degree Type		
B.S.	133	68.56%
M.S.	18	9.28%
Ph.D.	6	3.09%
Unspecified	37	19.07%
Graduation Year		
2014	13	6.70%
2015	41	21.13%
2016	67	34.54%
2017	39	20.10%
2018	7	3.61%
Other	27	13.92%
Major		
CS	157	80.93%
Non-CS	37	19.07%
Non-CS (CS Related)	*27*	*13.92%*
Non-CS (CS Unrelated)	*10*	*5.15%*

Table 5.2. Demographic information from pre-and-post surveys.

Trait	*Amount (Pre/Post)*		*Percentage (Pre/Post)*	
Gender				
Male	90	150	78.95%	77.72%
Female	23	50	20.18%	25.91%
Unspecified	1	3	0.88%	1.55%
Degree Type				
B.S.	110	N/A	96.49%	N/A
M.S.	3	N/A	2.63%	N/A
Ph.D.	0	N/A	0.00%	N/A
Unspecified	1	N/A	0.88%	N/A
Class Year				
Freshman	5	6	4.39%	3.11%
Sophomore	48	93	42.11%	48.19%
Junior	31	65	27.19%	33.68%
Senior	27	27	23.68%	13.99%
Graduate	3	2	2.63%	1.04%
Major				
CS	72	78	63.16%	40.41%
Non-CS	42	115	36.84%	59.59%
Non-CS (CS Related)	*34*	*46*	*29.82%*	*23.83%*
Non-CS (CS Unrelated)	*8*	*69*	*7.02%*	*35.75%*

for a tool like CS CONNECT. Specifically, the survey was designed to answer if students already knew a majority of their peers, and whether they felt like they belonged in their major or if they felt isolated. Another purpose of the pre-survey was to determine if social media might be an effective way to increase sense of community, by seeing how regularly students use social networks and how comfortable they are with different features of social networks.

5.2.1 Pre-Survey: Community Involvement

The first few questions in the survey identified how much students were actively participating in community events and clubs. Table 5.3 and Figure 5.2 show that students were mostly infrequent participants in CS campus events; half of the surveyed students stated they had not yet attended any events, and very few of the surveyed students stated they participated in a main CS club on campus. Only 29% of students had attended more than a single CS campus event, and 86% do not belong to any CS-related clubs.

Table 5.3. Rate of CS club participation among surveyed students.

Club	# Students Participating	% Students Participating
ACM-x	15	7.77%
ACM-w	9	4.66%
LUG	9	4.66%
None	166	86.01%

A second series of questions in the pre-survey determined how comfortable students were with their CS classroom environments. Figure 5.3 shows the existing

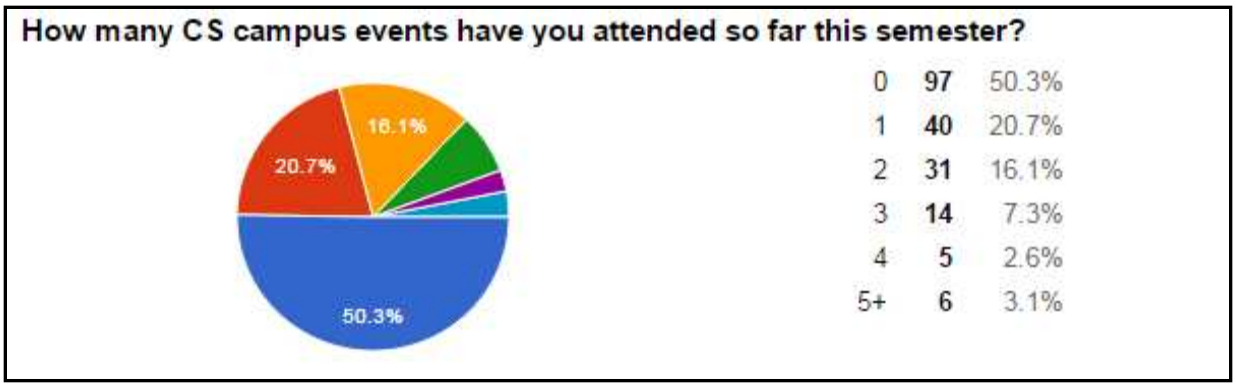


Figure 5.2. Number of CS events attended by surveyed students.

level of comfort that students stated they had with their CS peers. The majority of students, for all of the presented social situations, indicated that they only knew a few people that fit each category. The survey results indicate an overall consensus that most students know a few of their peers very well, but are unfamiliar with the rest of their CS classmates.

Figure 5.4 shows how students feel about meeting other students in their major. While few students (only 16.1%) indicated that they encounter difficulty meeting other students in their major, a large majority (79.8%) indicated that they would like to meet more students in their major and that it is important to them. This portion of the survey indicates that students would appreciate help meeting other students.

Figure 5.5 shows how students feel about communities in general, as well as their opinion on how well they belong to the CS community. According to the survey results, a majority of students (66.8%) agree that belonging to a community is important, but only 27% feel that they belong to the CS community at Mines. Furthermore, 13.50% actively feel isolated pursuing a CS major.

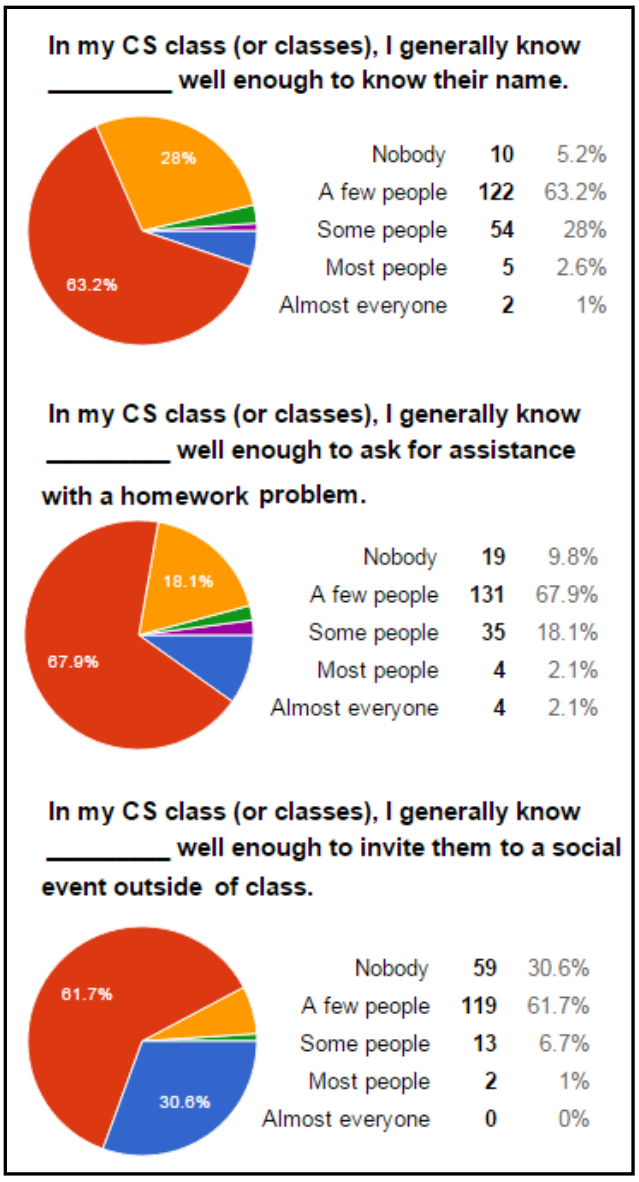


Figure 5.3. How well surveyed students know their CS peers.

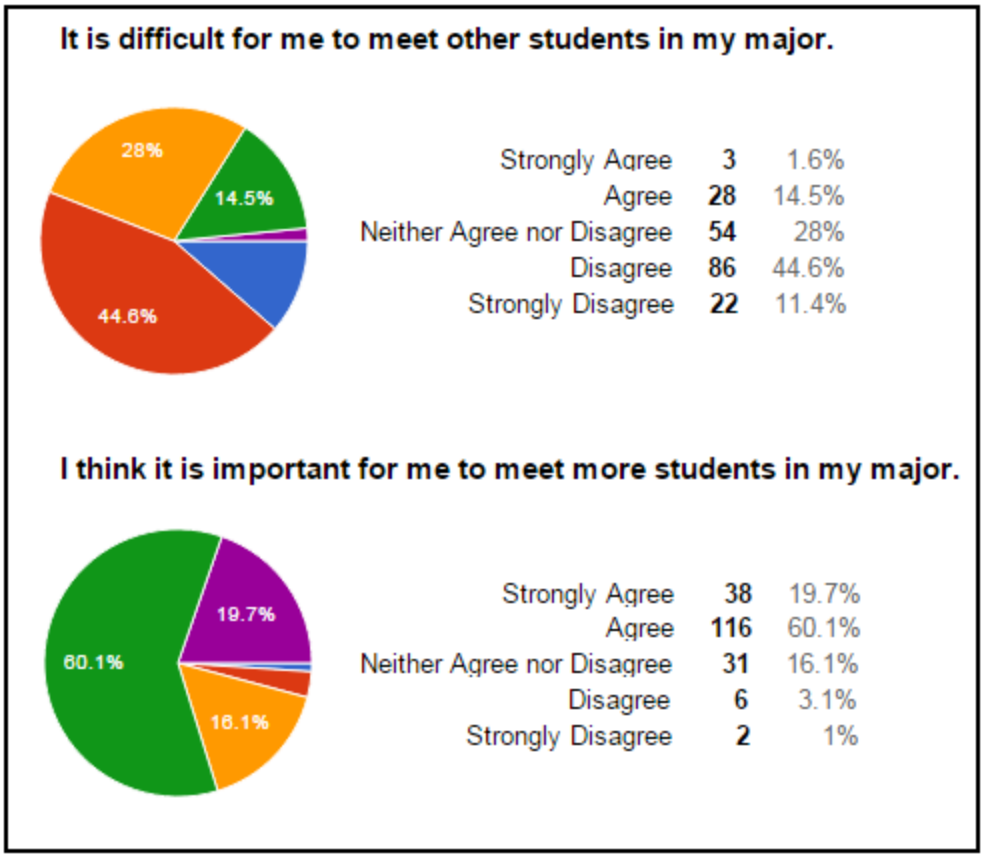


Figure 5.4. Students' feelings on meeting others in their major.

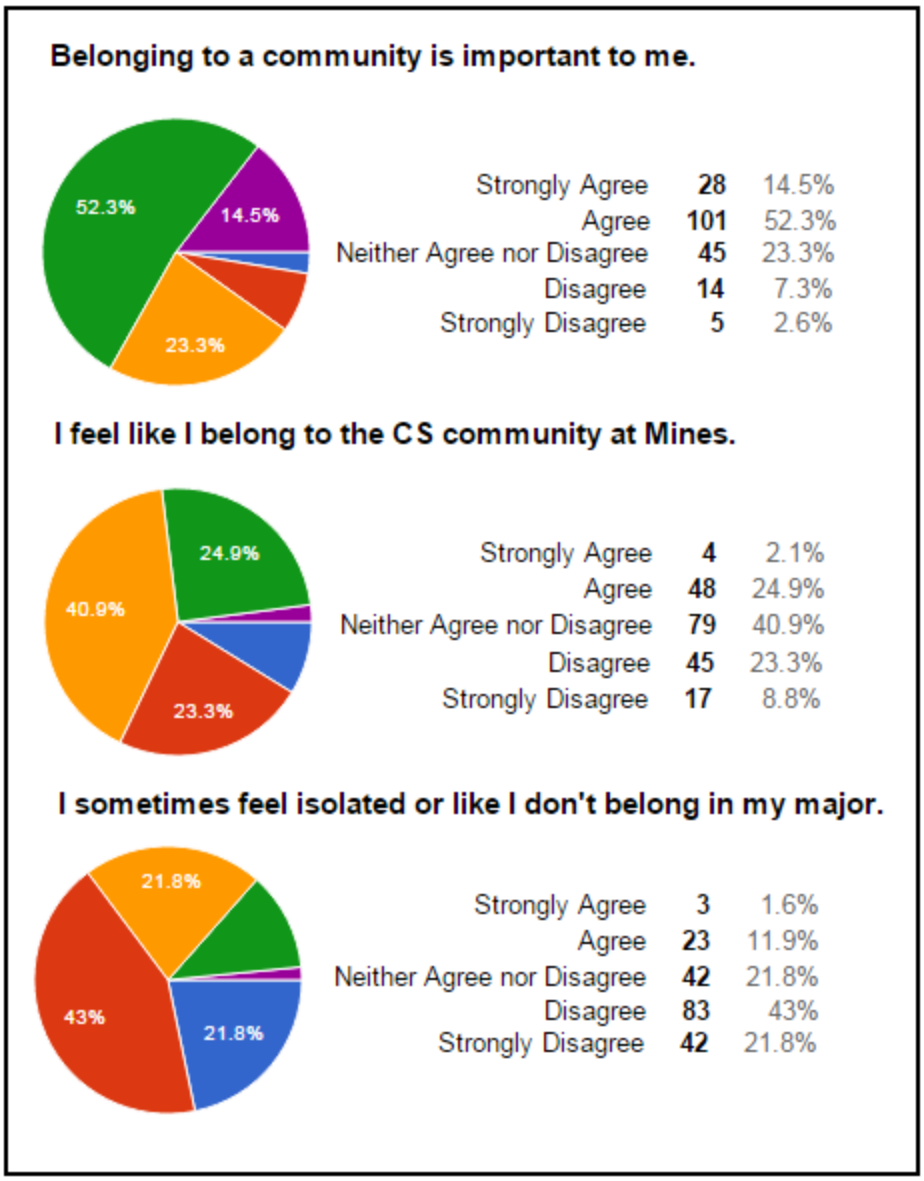


Figure 5.5. Student opinions on communities and specifically the CS community at Mines.

5.2.2 Pre-Survey: Social Networking

After determining involvement in the CS community at Mines, the survey asked opinions regarding social networking, in an attempt to gauge how comfortable students felt when interacting via social media. Figure 5.6 shows the results from the survey.

When asked if they feel comfortable interacting with others via social media, 62.2% stated they were; however, when asked if they enjoy meeting *new* people via social media, less than 25% agreed. This result indicates that a site such as CS CONNECT may have limited ability in helping students meet others within their major. The survey also indicates that approximately 40% of students are comfortable contributing to social media, but approximately 30% are not comfortable. Furthermore, only approximately 21% of students want to be more comfortable contributing. From these results, we expect only a subset of students to actively contribute content to CS CONNECT.

Lastly, the survey asked students to rate various goals related to social networking. Specifically, we asked students to determine how important social networks were in connecting with family, friends, and professionally, as well as how important social networks were for sharing media and for staying up-to-date with news relevant to a student's interests.

Figure 5.7 shows students' preferences for connecting with others via social media. Professional connections rated as the least valuable motivator (on average) for using a social network. Family was recognized as being of mixed importance, with a large amount of students (28%) stating that it is of least importance for using a social

network. Friends were recognized as the group most important for influencing social media usage, with 59% of students responding with a 4 or a 5. This result shows that students surveyed used social networks primarily as a way of connecting with their peers.

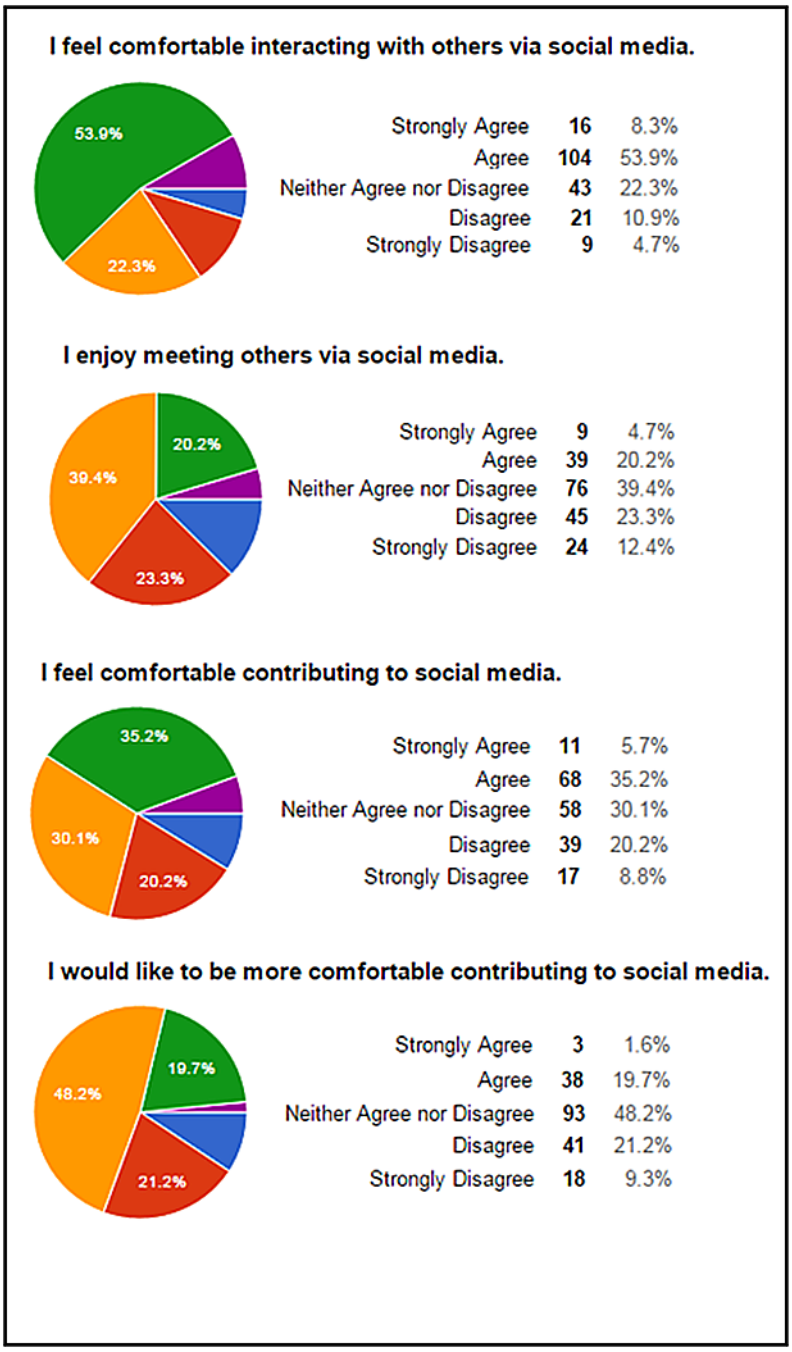
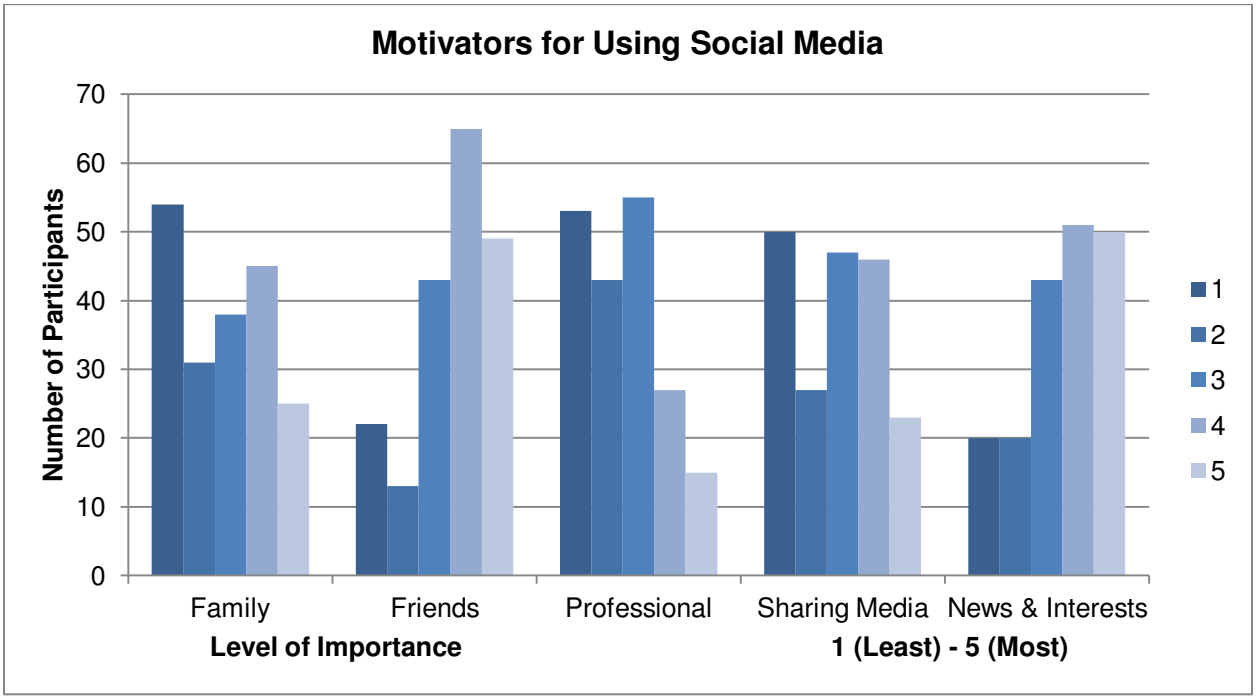


Figure 5.6. Students' feelings towards social media interaction.

To see if a student preferred to actively contribute content or passively receive news about their interests, the last two categories in Figure 5.7 can be analyzed. Sharing media was perceived in a mixed way, with about a third of students stating they found sharing media important and about 40% responding that sharing media was not important. Staying up-to-date with news relevant to a student's interests was an important motivating factor in social media usage, with 52% of students choosing a 4 or 5.



Importance of Different Social Media Motivators						
	1 (Least)	2	3	4	5 (Most)	Average
Family	54 (28%)	31 (16%)	38 (20%)	45 (23%)	25 (13%)	2.77
Friends	22 (11%)	13 (07%)	43 (22%)	65 (34%)	49 (25%)	3.55
Professional	53 (27%)	43 (22%)	55 (28%)	27 (14%)	15 (08%)	2.52
Sharing Media	50 (26%)	27 (14%)	47 (24%)	46 (24%)	23 (12%)	2.82
News & Interests	20 (10%)	20 (10%)	43 (22%)	51 (26%)	50 (26%)	3.49

Figure 5.7. The importance of different social media motivators ranked from 1-5.

5.2.3 Post-Survey Comparison

A survey in April 2015 repeated many of the questions in the pre-survey conducted in October 2014 in order to perform a paired T-test statistical analysis on users who actively used CS CONNECT. Appendix D shows a full catalogue of paired T-tests. The post-survey was targeted at CSCI 261, CSCI 262, and CSCI 306 to attempt to capture similar students groups as the pre-survey from October 2014. This survey was also given in-class with time to complete the survey as a part of class time. 114 responses were recorded for the post-survey.

Table 5.4 shows p-value results with a 95% confidence interval on the difference between pre-and post-survey results. Since few surveyed students in the post test reported that they had used CS CONNECT (only 38 students), and the surveys were conducted during different semesters so that the same groups of students could not be reliably targeted, only 9 students had pre-and-post survey results (by unique student IDs). Due to this, none of the paired T-test results could be determined as statistically significant.

We note, however, that one of the T-tests nearly reached statistical significance (the p-value for "I feel like I belong to the CS community at Mines" was 0.05; a p-value <0.05 would be considered significant). Although this result seems promising (i.e., worthy of future study), with a sample size of only 9 students and a six-month gap between pre and post surveys, no conclusions can be reached. A more controlled study would be needed to determine whether CS CONNECT actually had any impact, as many events over the course of October 2014 to April 2015 could change student attitudes.

Table 5.4. Results of statistical significance of survey differences from CS CONNECT users between the pre-and-post surveys.

Question	Pre-Survey Mean	Post-Survey Mean	StdDev of Difference	p
It is difficult for me to meet other students in my major	2.78	3	1.09	0.29
I think it is important for me to meet more students in my major	4	4.11	0.35	0.77
I sometimes feel isolated or like I don't belong in my major	2.44	2.56	0.93	0.83
Belonging in a community is important to me	4	3.44	0.34	0.11
I feel like I belong to the CS community at Mines	3.22	3.78	0.88	0.05

5.3. Overall Site Usage

Site usage data was collected and analyzed during the entire Spring 2015 semester. During this time, users generated over 18,000 http requests from site interactions. Figure 5.8 shows the unique (by logged-in user) hits per day on the site newsfeed. The base URL of CS CONNECT directed people to the newsfeed, which caused the newsfeed to get the most traffic and be the feature most indicative of the traffic for the site as a whole.

5.4. Site Usage Motivators

Throughout the semester, we explored a variety of techniques to increase site usage. We discuss these motivators in this section.

5.4.1 Emails

One identified source of motivation for users to visit the site were emails. Emails to announce competitions, promote CS Challenge Questions, and announce winners of

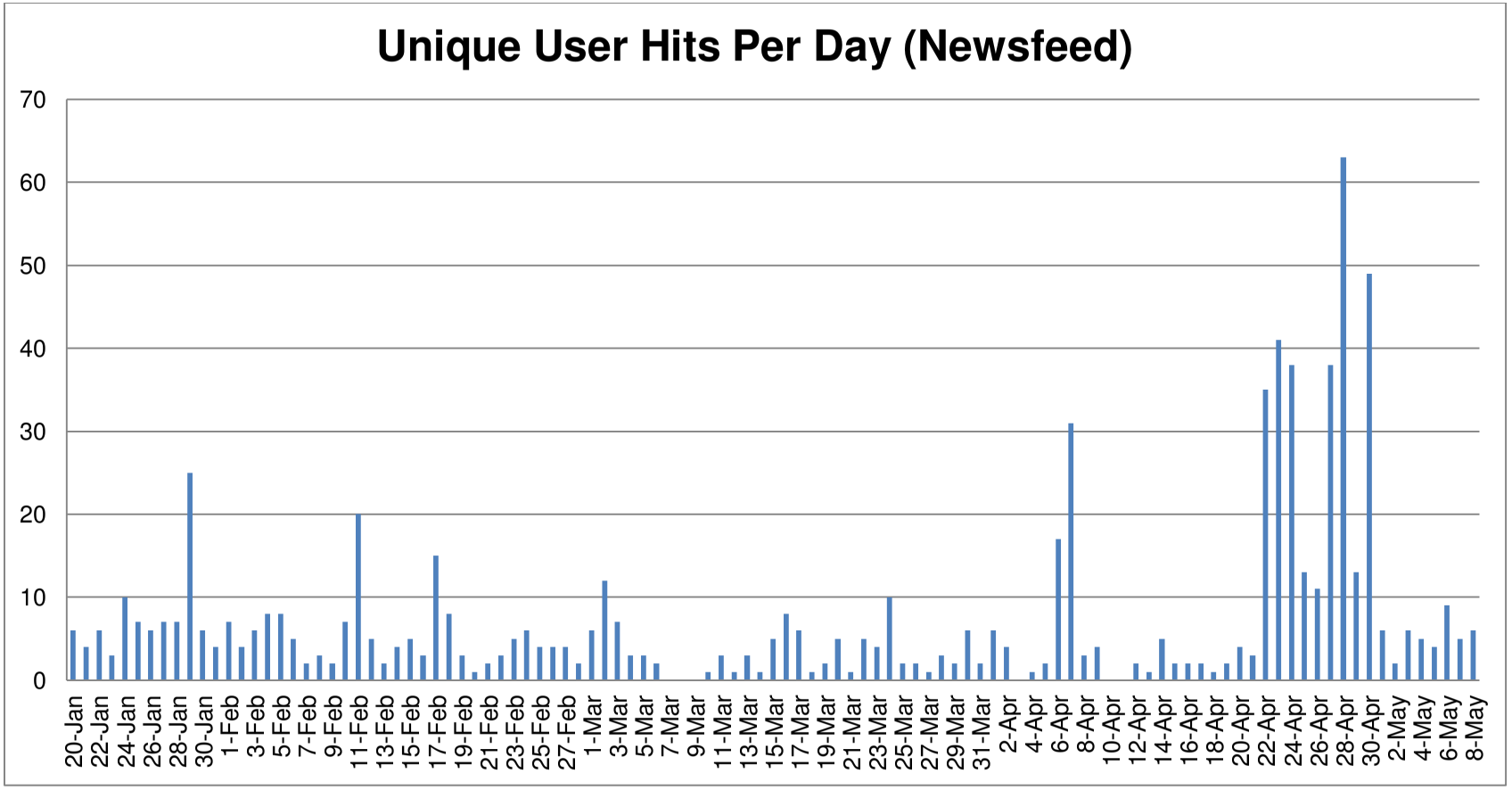


Figure 5.8. Unique visitors to the newsfeed over time.

competitions were sent to all users who did not actively opt-out of receiving emails. Figure 5.9 shows the same site usage data from Figure 5.8, but with the days where site-wide emails were sent out highlighted in red. Days that emails were sent saw an average of 19.88 unique users per day on the newsfeed, while days where emails were not sent only saw an average of 6.19 unique users per day on the newsfeed. This result shows a strong correlation between sending emails and users visiting CS CONNECT, and makes sending emails one of the strongest motivating factors.

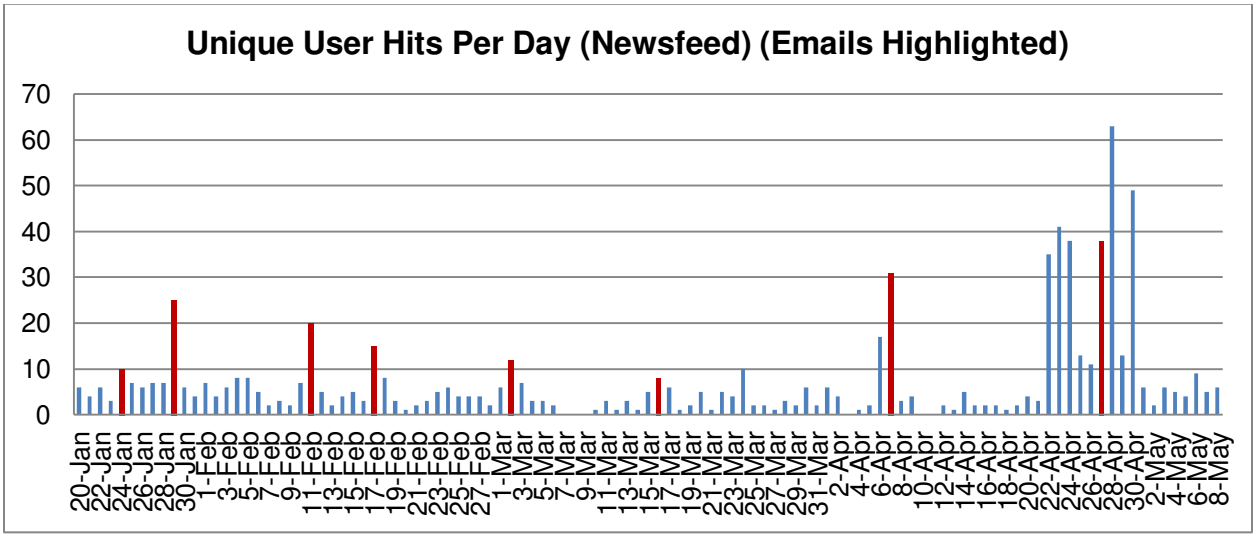


Figure 5.9. Unique visitors to newsfeed with days where emails were sent highlighted.

5.4.2 Competitions

Competitions were also a successful motivator for users to interact with the site. The newsfeed saw increased traffic during competitions when compared to days where competitions were not active. Figure 5.10 shows unique newsfeed views with the different competitions highlighted, as well as average page hits during each period. Page hits are defined as any http GET method request that returns a view to the user. While the humor competition, which prompted users to submit a humorous post for a

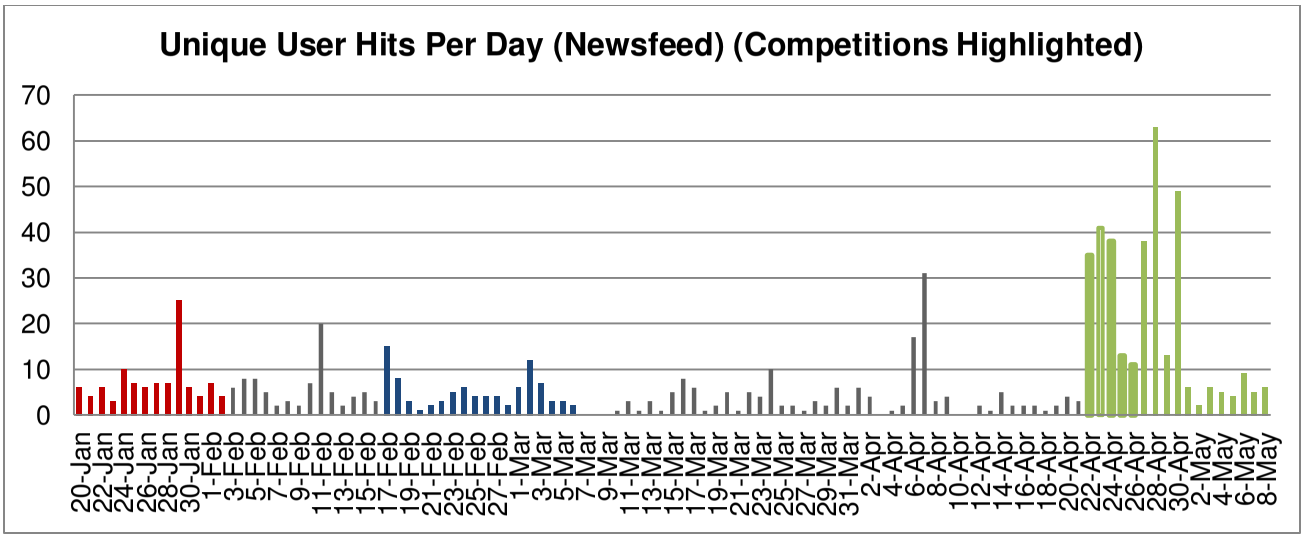
chance to win a prize, only saw a slight increase in site traffic, other competitions showed vastly increased traffic. The final CSCI 306 (*Software Engineering*) and high score competitions ran concurrently and reached average page hits of almost three times non-competition days. In addition, 26% of users who participated in the high scores competition were female, while only 16% of site users are female, suggesting that competitions involving content consumption may be very effective in motivating women to participate.

5.5 Site Feature Usage

Site usage for each individual feature was tracked over time to determine which features users utilized the most and any associated usage patterns. User hits were identified uniquely by login, and logs were generated from every visit and interaction with the feature.

5.5.1 Competitions

Figure 5.11 shows unique hits from users on the main competition portal page. The competitions feature received steady views during sponsored competitions, saw a decrease in viewership during times when there were no active competitions, and, during peak competition times, saw significant viewing surges. The figure also demonstrates that the high score competition (the last competition) was both a motivator for students to visit CS CONNECT and to participate in consuming or contributing to an active competition.



Event	Total Hits	Number of Days	Average Hits Per Day
Winter Competition	102	14	7.29
Humor Competition	90	18	5.00
High Score / 306 Competition	212	18	11.78
None (Normal Day)	246	60	4.10

Figure 5.10. Unique newsfeed views during sponsored competitions.

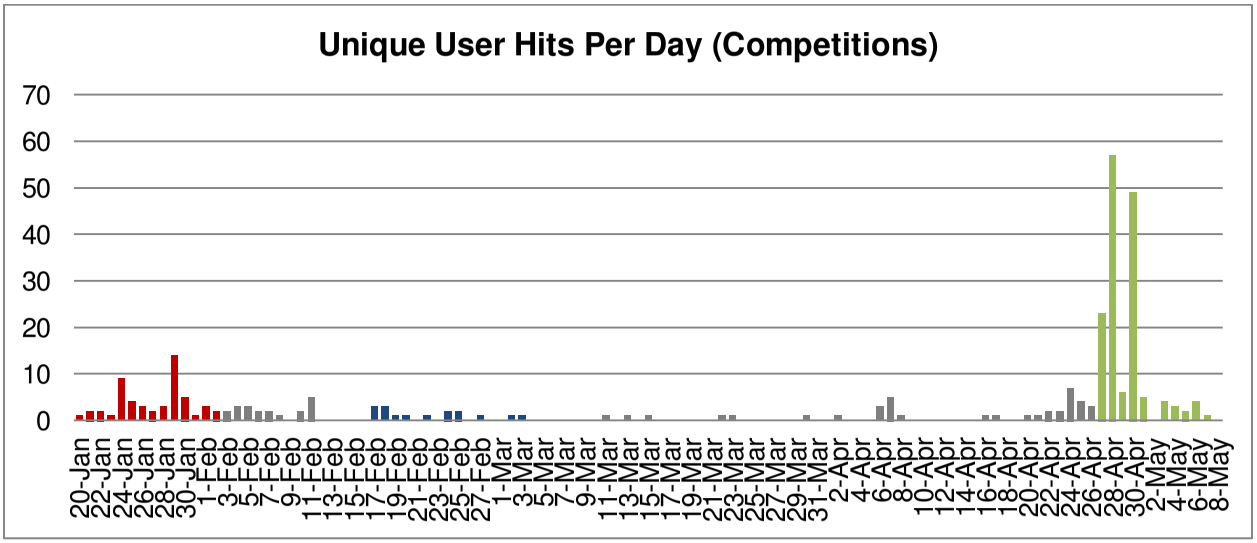


Figure 5.11. Unique hits per day on the main competitions portal. Competitions are highlighted according to the color scheme in Figure 5.10.

5.5.2 CS Challenge Question

Figure 5.12 shows unique user hits on the CS Challenge Question page. The graph shows that the CS Challenge Question may not be a powerful usage motivator by itself, but some students participate when promoted via email (e.g. on February 11th and April 6th) and when prizes are rewarded.

While 74 users viewed the main CS Challenge Question page, only 39 of these users viewed an individual question; however, out of the 39 users that viewed a question, 36 (7 female, almost 20%) of them viewed more than one. Out of these users, 8 users (10.8% of users that viewed the CS Challenge Question page and 20% of users that viewed several challenge questions) submitted a total of 16 answers. Thus, 80% of users are categorically "passive consumers" of content. We also note that no female students submitted answer, but since almost 20% of the passive consumers where female, it's possible that these women still found the CS Challenge Question to have some value.

Questions were selected from popular interview studying materials, including the book "Cracking the Coding Interview" by Gayle McDowell, in order to be relevant to students potentially seeking job interviews. Since 92% of students who viewed CS Challenge Questions viewed more than one, students likely found the questions engaging and/or useful to them. Students who answered also tended to answer on more than one question, suggesting that answering questions was engaging to some students; the possibility of winning prizes was, perhaps, a helpful motivator.

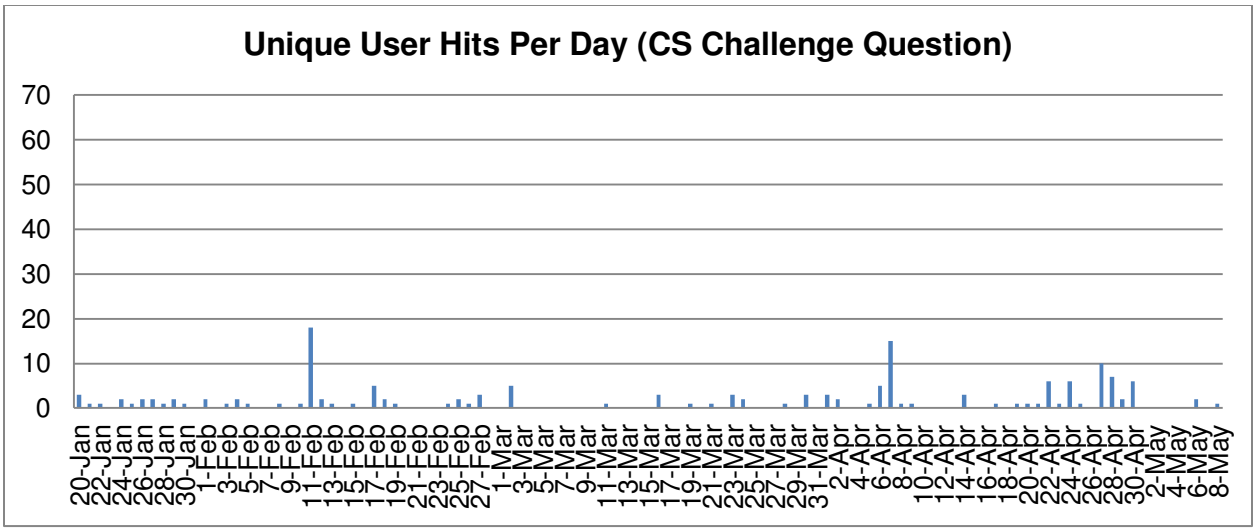


Figure 5.12. Unique hits per day on CS Challenge Question page.

5.5.3 Search Tool and User Profiles

Figure 5.13 shows that the user search page received sporadic use over the course of the CS CONNECT deployment. We note that feature usage was correlated with site usage, even if the site usage was driven by an unrelated factor (e.g., competitions). This result shows that if users had an initial reason to visit the site, many also took that opportunity to explore other features of the site, possibly due to our improved navigation design in CS CONNECT.

Figure 5.14 shows similar results, in that usage was sporadic, but also that just visiting the site for a competition was motivation for users to view profile pages and, potentially, connect with others. We also know that many profiles were viewed via the "people you should meet" feature, or by clicking on a profile link in a content submission, as the profile view counts are higher than the search tool view counts; that is, user profiles can only be reached by searching, "people you should meet", or content submission links.

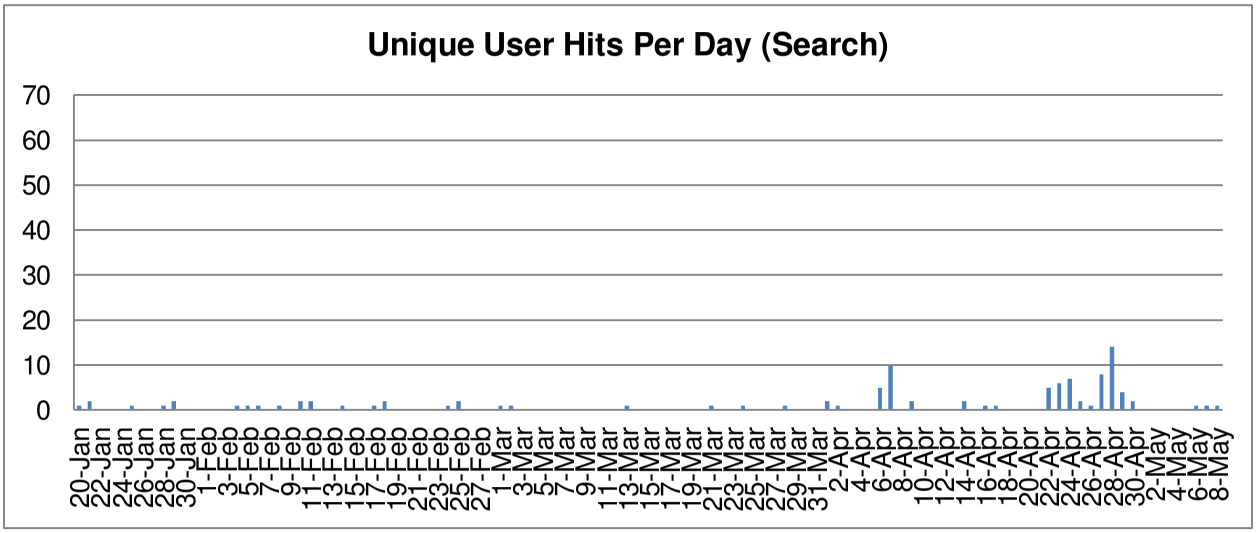


Figure 5.13. Unique hits per day on the user search page.

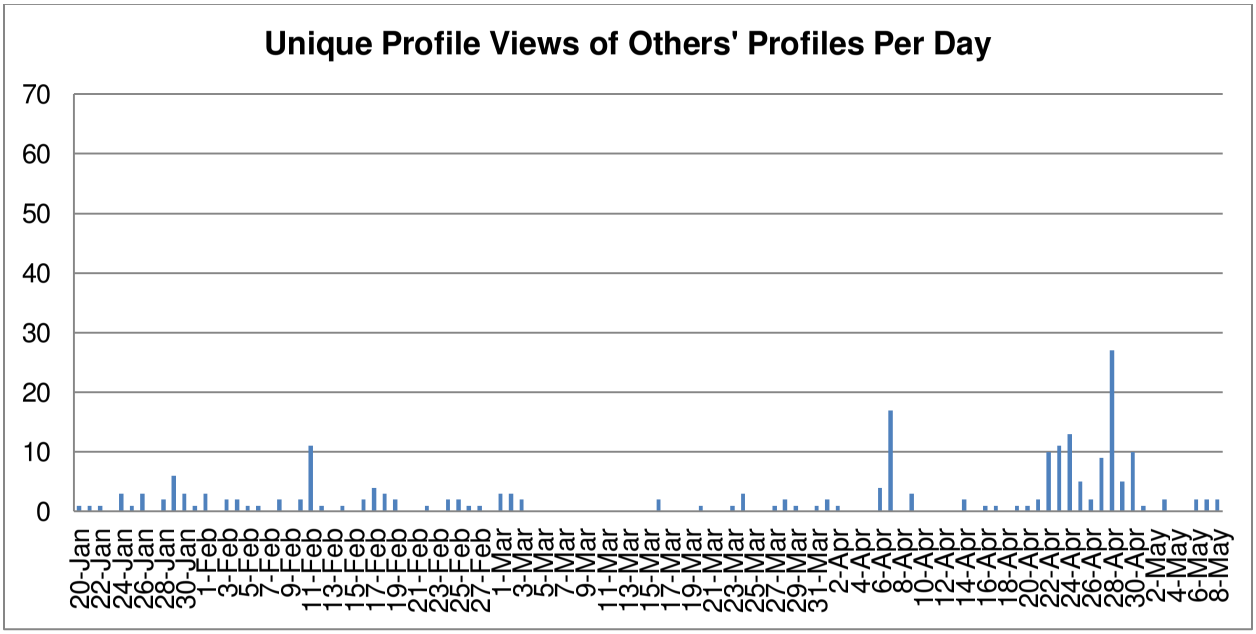


Figure 5.14. Unique hits per day on CS CONNECT profile pages that differed from the currently logged in user's profile page.

5.6 User-Contributed Posts

The newsfeed as a feature was generally underused. Table 5.5 shows a breakdown of content posted by users who were not involved in the development or research for CS CONNECT. Posts tagged as competition or project posts are auto-

generated posts that are automatically posted to the newsfeed whenever there is a new submission to a competition or the projects page.

The most used post markup feature was to embed a URL link and to give it a name (e.g., a link displaying the text "Google" that leads to "htpps://www.google.com"). Not including auto-generated posts, 13 posts were made by users who were not involved in the development or research of CS CONNECT. The most popular tag used outside of auto-generated posts was the "Fun" tag, perhaps used mostly during the Humorous Posts Competition.

Table 5.5. Breakdown of newsfeed posts by media type and post tags.

Content of Newsfeed Posts	
Media Type	**# of Posts**
Auto-generated	32
Link	6
Text	4
Video	1
Picture	1
Code	1
Newsfeed Post Tags	
Post Tag	**# of Posts**
Competitions	31
Fun	6
Job Opportunities	4
Video Games	2
Events	1
Projects	1
Total	**44**

5.7. Feedback

Feedback about the CS CONNECT system was taken primarily from a survey conducted during class in April 2015, as well as during a small focus group where we interviewed two female students in-depth. The survey was conducted in a computer lab where students had access to the site while completing the survey.

5.7.1 Feedback: Site Aesthetics

One hypothesis from the original CS CONNECT research was that improving site visuals would encourage users to explore the site and utilize site features more than the previous CS CONNECT version. In order to get feedback about the site aesthetics in a meaningful way, a focus group was conducted with two female computer science majors who were both unfamiliar with CS CONNECT. Although a focus group so small is certainly not ideal, a limited pool of potential participants, due to a lack of responses from considered participants, constrained the focus group to only two individuals. The participants were asked questions about their opinions and thoughts while being shown visuals from CS CONNECT, the previous version of CS CONNECT from 2013-2014, and a deployment of the original CONNECT conference networking tool. Before being asked for feedback on visuals, participants also heard a brief description of the site and its goals so that visual layout could be analyzed in correlation to expected site usage from the participants' perspectives. Site descriptions did not include what research the sites were from, who made the sites, or the time periods that the sites were developed and/or deployed so as to minimize bias.

When asked how important aesthetics were for websites in general, both participants agreed that a website's aesthetics are extremely important unless the website provides an irreplaceable service that must be accessed regardless. One participant also commented that site aesthetics determine how a site is used because of content organization and placement.

The first website to be reviewed was the original CONNECT tool for conferences. Initial impressions of the site were mostly positive, with comments focusing on a strong and identifiable logo, as well as a generally pleasing appearance. Slightly negative comments were made on the site's "cluttered right hand side" and a large amount of unpleasant visible text.

The second website to be reviewed was the original version of CS CONNECT from Thomas Brown's research [18]. Participants responded negatively to the visual content of the site, stating that it was cluttered and lacked visual appeal. One participant also expressed a desire for a way to filter the main posts on the newsfeed because of the overwhelming amount of visible content. Although both participants stated that the idea behind a site like CS CONNECT was valid and interesting, they concluded that the original CS CONNECT had many aesthetic flaws and was too disorganized, which discouraged use because of a lack of a friendly interface.

Finally, participants were shown the new CS CONNECT. Comments on the new CS CONNECT were very positive, with participants noting that the site was cleaner than the previous two sites and that inline posting content was much more inviting for a user who wished to contribute content. A small negative comment was made on the choice

of font for the page title, but the participant also stressed that it was not a large enough mistake to discourage use.

The participants concluded that the new version of CS CONNECT was more aesthetically pleasing than the previous version. In addition, the participants stated that the visuals of the new site should encourage site participation more, and should enable users to more easily access and benefit from different site features.

5.7.2. Feedback: Site Features

A primary goal of the feedback survey was to determine student opinions on various site features. Student responses on feature usefulness are given in Figure 5.15, and show how students who identified themselves as having used CS CONNECT during the semester felt about different site aspects. There were no major discernible differences between ratings from females and males on site features.

The most popular features were the projects and competitions, as indicated by their average rating scores. This result shows that users of CS CONNECT appreciated the value of original content and the ability to submit their own or to view the work of their fellow students. CS content was the factor that drove usage of CS CONNECT. The fact that Competitions had a slightly higher average than projects could indicate that users see competition as an added benefit; that is, the competition feature is functionally very similar to the project feature, with the only difference being the ability to compete among peers for prizes and recognition.

The CS Challenge Question page and user search received positive feedback, with 50% of surveyed students rating them a 4 or 5 in usefulness. Newsfeed, user

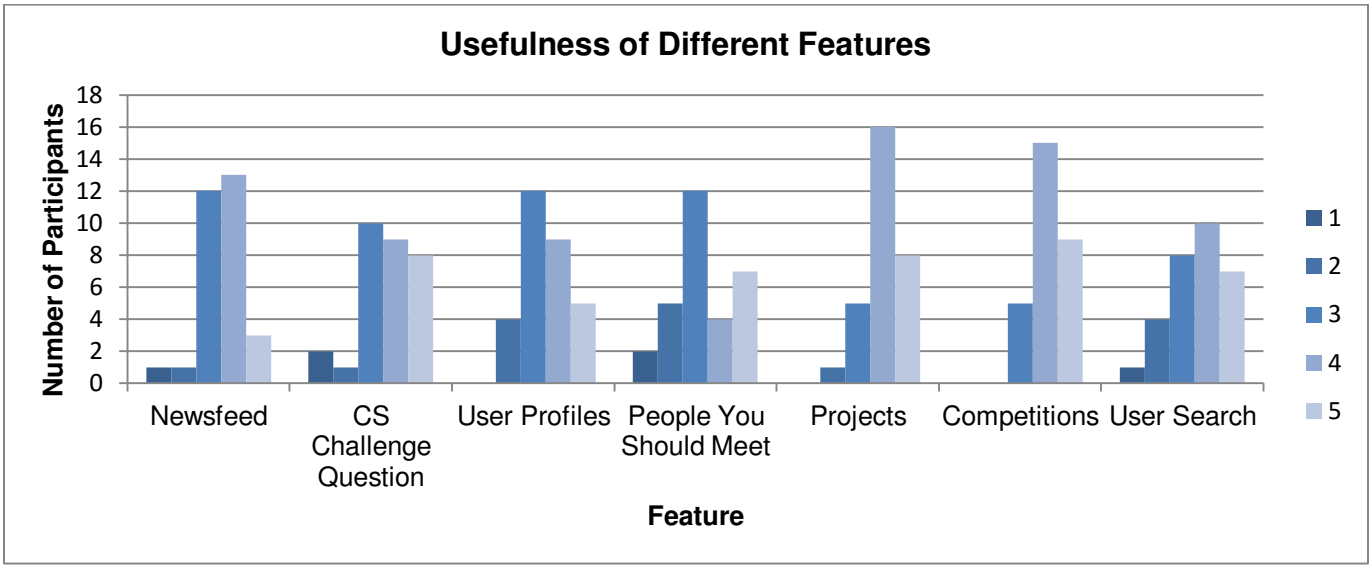
profiles, and "people you should meet" all received mixed feedback from users, indicating that these features were not key in motivating site interaction and participation.

Lastly, "people you should meet" was decided as the least useful feature of CS CONNECT. Not only did it have the lowest average score of the features, but it received the largest amount of 1 or 2 votes. The lack of enthusiasm for the "people you should meet" tool could stem from a desire for anonymity expressed among CS students, as well as the lack of a well-developed algorithm for showing users with similar user profiles (versus choosing user profiles at random). Students also may not see CS CONNECT as a platform for meeting new people, but more as a place to contribute and consume organized content.

In general, features with high ratings (e.g., Competitions, CS Challenge Question) saw consistent and growing use over the course of the semester. However, despite the high rating by users, the projects feature only saw a single upload from a non-admin user (see Table 5.5.). The root of this discrepancy is difficult to determine and requires future research.

5.7.3 Feedback: Social Networking

Feedback on social networks and networking in general was also gathered from students in April 2015 as a part of the post-survey, although these questions did not correspond to questions asked in the October 2014 pre-survey. An attempt was made to analyze opinions of existing social networks in order to compare the social networks and determine features that the most enjoyable networks have in common.



Usefulness of Different Features						
	1(Least)	2	3	4	5 (Most)	Average Rating
Competitions	0 (00%)	0(0%)	5 (17%)	15 (50%)	9 (30%)	4.14
Projects	0 (00%)	1(3%)	5 (17%)	16 (53%)	8 (27%)	4.03
CS Challenge Question	2 (07%)	1(3%)	10 (33%)	9 (30%)	8 (27%)	3.67
User Search	1 (03%)	4(13%)	8 (27%)	10 (33%)	7 (23%)	3.60
Newsfeed	1 (03%)	1(3%)	12 (40%)	13 (43%)	3 (10%)	3.53
User Profiles	0 (00%)	4(13%)	12 (40%)	9 (30%)	5 (17%)	3.50
People You Should Meet	2 (07%)	5(17%)	12 (40%)	4 (13%)	7 (23%)	3.30

Figure 5.15. The usefulness of different features as rated on a scale of 1-5 by CS CONNECT users, sorted by average rating.

Figure 5.16 shows that CS students have a very wide range of social network consumption. Nearly the same amount of students spend 10 or more hours a week as students that do not use social networking at all.

Figure 5.17 shows how well different social networks were perceived among students. Reddit was seen as the most enjoyable social network by a wide margin, with an average rating nearly a whole point higher than any other reviewed social network. Users were also asked if they would rather contribute to a social network where identity is important (like Facebook) or where you can make anonymous contributions to the site (like Reddit). The majority of students (69.3%) indicated that they prefer sites that allow for anonymity the best. This is possibly due to CS majors, and even STEM majors in general, tending to be more introverted than people outside of the field.

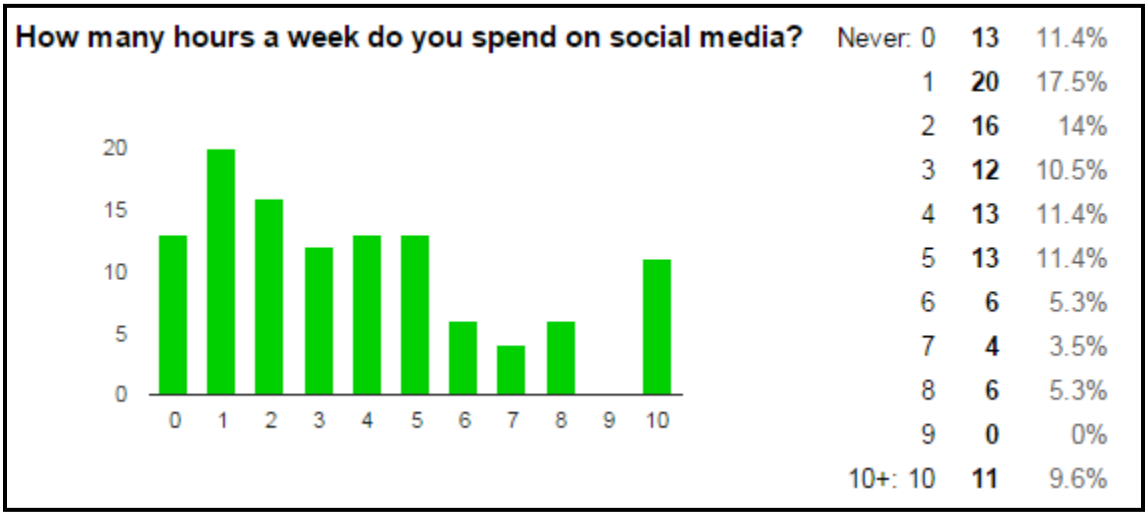
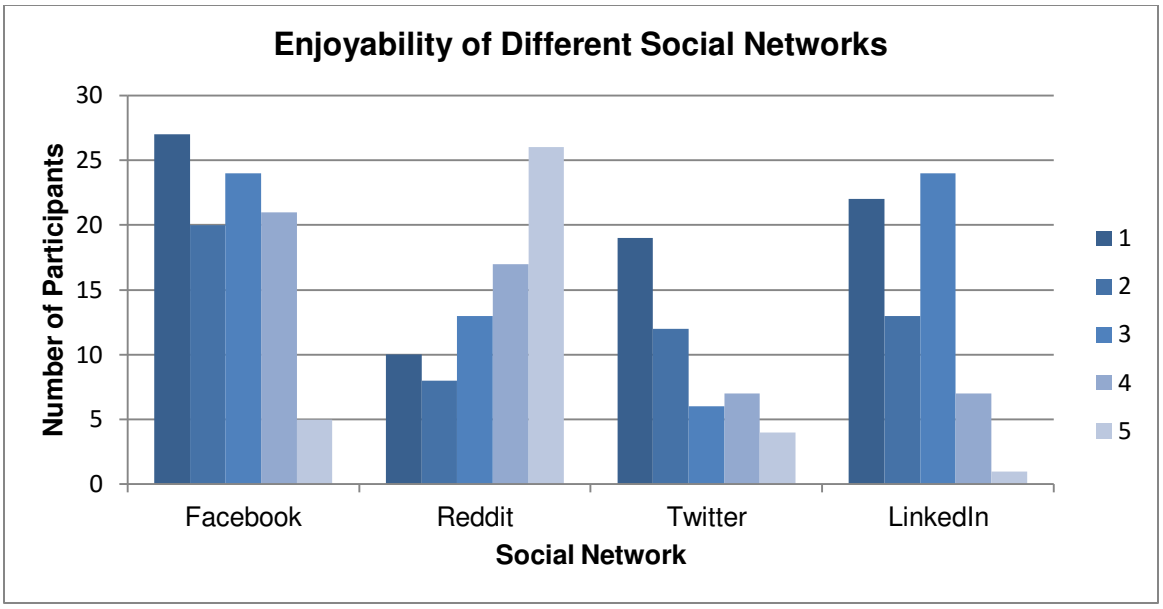


Figure 5.16. The time spent per week on social media by students.



Enjoyability of Different Social Networks							
	1 (Least)	2	3	4	5 (Most)	Average	Not Used
Reddit	10 (09%)	8 (07%)	13 (11%)	17 (15%)	26 (23%)	3.55	40 (35%)
Facebook	27 (24%)	20 (18%)	24 (21%)	21 (18%)	5 (04%)	2.56	17 (15%)
LinkedIn	22 (19%)	13 (11%)	24 (21%)	7 (06%)	1 (01%)	2.28	47 (41%)
Twitter	19 (17%)	12 (11%)	6 (05%)	7 (06%)	4 (04%)	2.27	66 (58%)

Figure 5.17. How much different social networks are enjoyed, sorted by average rating.

CHAPTER 6

CONCLUSIONS

In this section, I draw meaningful conclusions from my results and extend them to my original research questions. This section sums up the most meaningful conclusions from the research data with the evidence presented in the results section above.

6.1 Usage Motivators

Motivators to use CS CONNECT were beneficial for site usage. Emails were particularly helpful both in getting users to visit the site, and teaching users about new features and encouraging them to check out the new features and explore the site. Competitions were another major source of user interest and clearly generated an increased interest from users in CS CONNECT. Site usage was at an all-time high during the final semester competition, and every site feature saw increased usage during competition times. Prizes also provided a small incentive to go and use some of the site features, such as posting new content (in the case of the humorous post competition), answering CS Challenge Questions, contributing large user-made content (in the case of the winter games competitions), and browsing through and interacting with submissions from other users (in the case of the high scores competition).

6.2 Creative Content Generation and Sharing

Students indicated on surveys that they desire a platform to enable the sharing of original creative content, but few students contributed user-made content that was outside of coursework. We hypothesize that most students desire these platforms to

consume content from other users, while only a small percentage of students like to share their own creations.

6.3 Peer Networking via Social Networks

Survey results indicate that students would mostly like to connect with peers and feel more comfortable in their major, but many CS students are weary of or uninterested in using a social networking site to meet new peers. Without additional support and encouragement, CS students are unlikely to meet other students just via CS CONNECT. But the results show that, even though People You Should Meet and Search features were not rated highly, if users were on the site for other reasons, they did occasionally view other students' profiles. Previous research from CONNECT has shown that setting networking goals can be effective for a subset of users [5]. Based on the survey results, students at this state tend to prefer anonymity and don't participate as much in professional networks. Future iterations of CS CONNECT could explore additional features to mentor students and help them understand the value of networking to overcome students' desire to conceal their identity online.

6.4 Site Aesthetics

Aesthetics play a key role in user retention across a single session and promote visiting different parts of a site when links are clearly organized. In contrast to the original CS CONNECT, many users of the new site took the opportunity to explore features after something initially motivated the user to visit or join CS CONNECT. The importance of site aesthetics was also enforced by the results of the focus group; the

participants praised the changes that were made to CS CONNECT to make it better organized.

6.5 Future Work

One of the issues determining how useful CS CONNECT is at promoting social connections between peers was a lack of content contribution by users. We hypothesize that computer science students are more weary of contributing to social networks because a familiarity with data collection leads to an increased desire for privacy. By performing research on how willing CS students are to contribute content to social networks with varying levels of self-identification (e.g., anonymous usernames, only first names, full names with profile pictures), we could identify an appropriate level of anonymity to promote interaction between users.

In order to determine whether CS CONNECT is a primary cause in changing students' feelings towards the computer science community or their peers, a long-term study would be helpful to track the effects of site usage over time. We would analyze usage of CS CONNECT across three or more semesters at Mines, and then compare with students who do not use CS CONNECT to determine what effects usage has on a student's sense of community in CS. In addition to this, it would be beneficial to conduct pre/post surveys during the same semester, so that the same exact groups of students can be targeted between the two surveys.

More research on using competition as a motivator to network and contribute content on a web application is also needed. Different types of competitions should be analyzed as well:

- Competitions with active content creation and contribution (e.g., game development competition)
- Competitions with active content consumption (e.g., game playing competition)
- Competitions with short-term content creation or problem solving (e.g., CS Challenge Question)

It would be beneficial to analyze the effects of having a social network with an active open-ended sharing platform for media (CS CONNECT Newsfeed) versus a social network focused only on features and direct user networking and profiles (CONNECT / LinkedIn). This could help us better understand the difference in results between CS CONNECT and the original CONNECT deployments.

Lastly, there are discrepancies between which CS CONNECT features were rating highly by users and which features were actually used. This is not surprising, as self-reports are notoriously inaccurate (i.e., how we describe our behavior often does not completely match our behavior). The feature with the largest discrepancy was the projects feature. Given the number of passive consumers in the CS Challenge Question, and the increased number of students who participated in the high scores competition compared to earlier competitions, a possible explanation is that students are interested in the work being done by their peers and eager to consume content, but lack resources or motivation to create content. To help clear up the differences between these results, focus groups where participants are asked to elaborate their feelings on questions similar to the surveys would be useful.

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APPENDIX A

CS CONNECT USER SURVEY

CWID*

My gender is:*
- Prefer not to respond
- Male
- Female
- Other

My year at Mines is:*
- Freshman
- Sophomore
- Junior
- Senior
- Graduate Student

My major at Mines is:*
- CS
- Non-CS (with CS Minor)
- Non-CS (no CS Minor)
- Undecided

This semester, I am taking:
- CSCI 261
- CSCI 262
- CSCI 306
- CSCI 400

Which of the following clubs are you involved with this semester:
- ACM-x
- ACM-w
- LUG

Which of the following clubs are you involved with this semester:

- [ ] ACM-x
- [ ] ACM-w
- [ ] LUG

How many CS campus events have you attended so far this semester?*
This includes Advising Sessions, Seminars, Hack-a-thons, Industry Events, C-MAPP Visit Days, etc.

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5+

For the questions on this page, select the word that best completes the statement.

In my CS class (or classes), I generally know _____ well enough to know their name.*

- ○ Nobody
- ○ A few people
- ○ Some people
- ○ Most people
- ○ Almost everyone

In my CS class (or classes), I generally know _____ well enough to ask for assistance with a homework problem.*

- ○ Nobody
- ○ A few people
- ○ Some people
- ○ Most people
- ○ Almost everyone

In my CS class (or classes), I generally know _____ well enough to invite them to a social event outside of class.*

- ○ Nobody
- ○ A few people
- ○ Some people
- ○ Most people
- ○ Almost everyone

I use social media websites (e.g. Facebook, Twitter, Reddit, etc.) _____ hours a week, on average.*

- ○ 0
- ○ 1-2
- ○ 2-4
- ○ 4-6
- ○ 6-8
- ○ 8-10
- ○ 10+

For the questions on this page, choose the word that best describes your agreement with the statement.

It is difficult for me to meet other students in my major.*

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

I think it is important for me to meet more students in my major.*

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

I sometimes feel isolated or like I don't belong in my major.*

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Belonging to a community is important to me.*

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

I feel like I belong to the CS community at Mines.*

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

I feel comfortable contributing to social media.*

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

I would like to be more comfortable contributing to social media.*

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

I feel comfortable interacting with others via social media.*

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

I enjoy meeting others via social media.*

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

Rate the ways in which you use social media from 1 (least important) to 5 (most important).

Connecting with family

1 2 3 4 5

Connecting with friends

1 2 3 4 5

Connecting professionally

1 2 3 4 5

Sharing media
e.g. posting pictures, videos, links, files, etc.

1 2 3 4 5

Staying up-to-date with news relevant to my interests

1 2 3 4 5

APPENDIX B

SITE FEEDBACK SURVEY SECTION

Did you use CS CONNECT at all at any time between November 2014 and now?*

- Yes
- No

CS CONNECT FEEDBACK

For each of the following site features, please indicate how useful the features is:

Newsfeed
The main site page (http://connect.mines.edu/newsfeed)

	1	2	3	4	5	
Not Useful	○	○	○	○	○	Very Useful

CS Challenge Question
Page to answer weekly questions for interview practice and to win prizes (http://connect.mines.edu/CSQuestion)

	1	2	3	4	5	
Not Useful	○	○	○	○	○	Very Useful

User Profiles
Profile pages for each user (http://connect.mines.edu/newprofile/3)

	1	2	3	4	5	
Not Useful	○	○	○	○	○	Very Useful

People You Should Meet
Sidebar throughout the site that suggests people in CS to meet.

	1	2	3	4	5	
Not Useful	○	○	○	○	○	Very Useful

Projects
A place to share code and personal projects (http://connect.mines.edu/projects)

	1	2	3	4	5	
Not Useful	○	○	○	○	○	Very Useful

Competitions
Compete in coding competitions or vote for the best submissions (http://connect.mines.edu/competition/11)

	1	2	3	4	5	
Not Useful	○	○	○	○	○	Very Useful

User Search
Search for users by name or by any text in the bio section of their profiles (http://connect.mines.edu/search)

	1	2	3	4	5	
Not Useful	○	○	○	○	○	Very Useful

What features, if any, would you like to see added to CS CONNECT?

CS CONNECT Usage

Share your experience with CS CONNECT this semester.

How many times did you visit CS CONNECT this semester?*

- ○ 1-2
- ○ 3-4
- ○ 5-10
- ○ 11+

APPENDIX C

SOCIAL NETWORKING SURVEY SECTION

Social Networking (1/2)

How many hours a week do you spend on social media?*
This includes: Facebook, Twitter, Reddit, LinkedIn, CS CONNECT, etc.

	0	1	2	3	4	5	6	7	8	9	10	
Never	○	○	○	○	○	○	○	○	○	○	○	10+

If you don't use social media, why not?

For the social networking sites listed below, please rank their appeal from a scale of 0 (Never Used) to 1 (Disliked) to 5 (Highly Enjoy):

Facebook*

	0	1	2	3	4	5	
Never Used	○	○	○	○	○	○	Highly Enjoy

Reddit*

	0	1	2	3	4	5	
Never Used	○	○	○	○	○	○	Highly Enjoy

Twitter*

	0	1	2	3	4	5	
Never Used	○	○	○	○	○	○	Highly Enjoy

LinkedIn*

	0	1	2	3	4	5	
Never Used	○	○	○	○	○	○	Highly Enjoy

The following 4 questions apply to all social networks, in general.

How would you rate your passive participation in social networking?*
That is, how often do you 'consume' content on social networking sites?

	1	2	3	4	5	
I never consume content	○	○	○	○	○	I absorb my feeds like a sponge.

How would you rate your active participation in social networking?*
That is, how often do you 'contribute' content on social networking sites?

	1	2	3	4	5	
I never contribute content	○	○	○	○	○	I post pictures of every meal I eat

Do you prefer social media where you can contribute anonymously (like Reddit), or where your identity is a central component of the site (like Facebook)?*

- ○ Prefer anonymous
- ○ Prefer identifiable

What factors encourage you to contribute to social media?

APPENDIX D

PAIRED T-TEST

Rate the ways in which you use social media from 1 (not important) to 5 (very important)

Connecting with family

	Before	*After*
Mean	3.555555556	2.888888889
Variance	3.027777778	2.361111111
Observations	9	9
Pooled Variance	2.694444444	
Hypothesized Mean Difference	0	
df	16	
t Stat	0.86154979	
P(T<=t) one-tail	0.200831573	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.401663147	
t Critical two-tail	2.119905285	

Connecting with friends

	Before	*After*
Mean	3.555555556	3.777777778
Variance	1.777777778	1.444444444
Observations	9	9
Pooled Variance	1.611111111	
Hypothesized Mean Difference	0	
df	16	
t Stat	-0.37139068	
P(T<=t) one-tail	0.35760932	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.715218641	
t Critical two-tail	2.119905285	

Connecting Professionally

	Before	*After*
Mean	3.222222222	3.111111111
Variance	1.444444444	2.611111111
Observations	9	9
Pooled Variance	2.027777778	
Hypothesized Mean Difference	0	
df	16	
t Stat	0.165521178	
P(T<=t) one-tail	0.43530357	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.87060714	
t Critical two-tail	2.119905285	

Sharing Media

	Before	*After*
Mean	2.777777778	2.888888889
Variance	2.194444444	1.611111111
Observations	9	9
Pooled Variance	1.902777778	
Hypothesized Mean Difference	0	
df	16	
t Stat	-0.17087153	
P(T<=t) one-tail	0.433233479	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.866466959	
t Critical two-tail	2.119905285	

Community Involvement

" It is difficult for me to meet other students in my major."

	Before	*After*
Mean	2.777777778	3
Variance	0.694444444	0.75
Observations	9	9
Pooled Variance	0.722222222	
Hypothesized Mean Difference	0	
df	16	
t Stat	-0.5547002	
P(T<=t) one-tail	0.293385476	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.586770951	
t Critical two-tail	2.119905285	

" I think it is important for me to meet more students in my major."

	Before	*After*
Mean	4	4.111111111
Variance	1	0.361111111
Observations	9	9
Pooled Variance	0.680555556	
Hypothesized Mean Difference	0	
df	16	
t Stat	-0.28571429	
P(T<=t) one-tail	0.389381407	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.778762813	
t Critical two-tail	2.119905285	

" I sometimes feel isolated or like I don't belong in my major."

	Before	*After*
Mean	2.444444444	2.555555556
Variance	1.777777778	0.777777778
Observations	9	9
Pooled Variance	1.277777778	
Hypothesized Mean Difference	0	
df	16	
t Stat	-0.20851441	
P(T<=t) one-tail	0.418729315	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.837458629	
t Critical two-tail	2.119905285	

" Belonging to a community is important to me."

	Before	*After*
Mean	4	3.444444444
Variance	0.5	0.527777778
Observations	9	9
Pooled Variance	0.513888889	
Hypothesized Mean Difference	0	
df	16	
t Stat	1.643989873	
P(T<=t) one-tail	0.059840228	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.119680457	
t Critical two-tail	2.119905285	

" I feel like I belong to the CS community at Mines."

	Before	*After*
Mean	3.222222222	3.777777778
Variance	0.444444444	0.194444444
Observations	9	9
Pooled Variance	0.319444444	
Hypothesized Mean Difference	0	
df	16	
t Stat	-2.08514414	
P(T<=t) one-tail	0.026716782	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.053433563	
t Critical two-tail	2.119905285	

" I feel comfortable contributing to social media."

	Before	*After*
Mean	3.888888889	3.222222222
Variance	0.611111111	1.444444444
Observations	9	9
Pooled Variance	1.027777778	
Hypothesized Mean Difference	0	
df	16	
t Stat	1.394971665	
P(T<=t) one-tail	0.09104449	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.182088979	
t Critical two-tail	2.119905285	

" I would like to be more comfortable contributing to social media."

	Before	*After*
Mean	2.666666667	2.888888889
Variance	1	1.111111111
Observations	9	9
Pooled Variance	1.055555556	
Hypothesized Mean Difference	0	
df	16	
t Stat	-0.45883147	
P(T<=t) one-tail	0.326263299	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.652526597	
t Critical two-tail	2.119905285	

" I feel comfortable interacting with others via social media."

	Before	*After*
Mean	3.777777778	3.444444444
Variance	0.944444444	1.527777778
Observations	9	9
Pooled Variance	1.236111111	
Hypothesized Mean Difference	0	
df	16	
t Stat	0.635998728	
P(T<=t) one-tail	0.266884946	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.533769892	
t Critical two-tail	2.119905285	

" I enjoy meeting others via social media."

	Before	*After*
Mean	2.777777778	2.777777778
Variance	1.694444444	0.694444444
Observations	9	9
Pooled Variance	1.194444444	
Hypothesized Mean Difference	0	
df	16	
t Stat	0	
P(T<=t) one-tail	0.5	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	1	
t Critical two-tail	2.119905285	