TwoBrains, The Learning Enabled Social Network (LESN)

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I hereby certify that this material, which I now submit for assessment of the programme of study leading to the award of Master of Science in Web Technologies is entirely my own work and has not been taken from the work of others save and to the extent that such work has been citied and acknowledged within the text of my work.

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Abstract

Online learning or eLearning is an ever expanding form of education. The same expansion can be seen in the uptake and use of social networks. With such huge numbers of users participating daily in these different domains an opportunity was seen to combine the two and create a new form of eLearning, the Learning Enabled Social Network (LESN). TwoBrains is a Learning Enabled Social Network that seeks to bridge the gap between social networks and eLearning. The application was developed to fulfill the needs of online learners in acquiring their educational attainment whilst providing them with appropriate means to engage dynamically with other online learners in an intelligent environment. A cohesive fusion of features and functionality has solidified into reality an application dedicated to providing an efficient and powerful educational experience fueled by the ideology and characteristics of online social networks. The three C's: creation, collaboration and community are the three steadfast cores upon which the application is constructed. Each of these cores reflect a specific need in an online learner that can be fulfilled though the use of the application. Creation can be fulfilled when a learner creates new content in the application such as creating new notes. Collaboration can be fulfilled when learners actively participate in discourse or utilize the communication features of TwoBrains like the live chat. Community can be fulfilled and sustained through the interactions of learners with each other using specifically designed functionality. TwoBrains has been found to be a powerful tool in aiding online learners achieve their self-directed learning goals. Its feature set appeals to online learners and users of social networks making them feel a sense of familiarity that aids in their participation with the application. TwoBrains is a powerful learning and social interaction device that provides learners with an encouraging environment to learn.

Definitions

eLearning: ELearning defines a set of technological features that facilitate teaching and learning in a dispersed manner.

Learning Enabled Social Network: The Learning Enabled Social Network is a term used to describe an eLearning environment provided through the means of a social network.

Social Network: A social network is an online social paradigm that allows users to interact with each other online using virtual constructs of real world mechanics such as relationships.

Abbreviations

CBL: Computer Based Learning

LESN: Learning Enabled Social Network

LMS: Learning Management System

SNS: Social Network Site

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1. Introduction

The Learning Enabled Social Network (LESN) is a powerful tool in providing eLearning. This chapter provides a brief history of eLearning starting from its earliest incarnations right through to modern eLearning practices in chronological order. The research question and area of contribution for this dissertation are also discussed.

1.1 Background

An effective history of eLearning is discussed by Ridgeway [44]. This history examines the beginnings and evolution of the construct and how modern technologies have changed and challenged it.

1.1.1 Distance learning

Distance learning, sometimes referred to as correspondence learning involves the distribution of materials to students usually by mail. This requires the learner to become self directed and disciplined in their studies. No group interactions occur which means that social interactions are at a minimum. Any gradable material is mailed away to be examined and graded which again removes much social interaction.

1.1.2 Computer Based Training

With the widespread adoption of the personal computer in the 1980's came Computer Based Training (CBT). The development of cheap cd rom technology meant that an organization could provide a large amount of material to the learner on a single disk. This form of learning shows the direct shift from print based learned to screen based learning. Ridgeway [44] describes the characteristics of the CBT. These characteristics include:

- Unfacilitated, the learner is seen as a passive absorber of content
- Self paced and not customized to an individuals learning style
- Very expensive to produce and dated quickly
- Content was very generic and lacked localized relevance
- Offered self paced flexible delivery where the student could learn any time at their own pace.

1.1.3 Online Learning

Following the birth of the World Wide Web in the late 1990's organizations quickly began to see the potential the Internet offered in terms of delivering educational attainment. Initially the same principles of distance learning were employed by simply emailing material to the learner. As the www and browser matured a new range of technologies became available to implement. This meant that now entire courses could be placed online. Many educational institutions also employed Learning Management Systems at this time also, enabling course materials to be stored online for access. The main idea at the time was to get as much content online as possible and if possible entire courses. Ridgeway [44]

describes the characteristics of the this phase of learning. These characteristics include:

- Existing content was simple placed online (Shovelware)
- Largely unfacilitated, focus was on content
- Educational institutions spent a great deal of money on resource development with the view that if we build it they will come
- Few if any standards, so little interoperability between delivery platforms
- Educational administrators assumed that online learning would save money in deliver, they were wrong
- LMS's replicated the traditional teacher centered class room environment

1.1.4 ELearning

The term eLearning itself originated in the literature for CBT in the 1990's. It is defined as the use of computer technology to deliver education or training courses to learners. ELearning can be presented in a number of ways: online, offline, a blend of modes or where there is live interaction with a virtual teacher or trainer. ELearning is flexible in that the learner choses when, where and how they learn.

1.1.5 Blended learning

The predominant model in use today is blended learning. This model integrates CBT, online and eLearning technologies with face to face learning methods.

1.1.6 Networked learning or eLearning 2.0

Web 2.0 defining characteristics

- The Web as a platform, web services which use the browser, easy to use
- The web is changing from a document delivery system to an application platform
- User generated content the driving force
- Easy to create, distribute and share content, often collaboratively via RSS
- The "Network Effect" - services improve the more people who join - e.g. del.icio.us, flickr
- Distributed content via RSS
- Folksonomic content classification using TAGS
- Makes it easy to find other users with similar interests and form online communities – Social Software
- Paradigm shift, web 1.0 to web 2.0 - Read Write web

This brief history seeks to serve as a base for which further discussion and research can be placed on. Without the evolution in learning techniques and technologies to support these then the world of eLearning simply could not exist.

1.2 Research Question

This dissertation seeks to explore the question,

“What are the components of and optimal design of a Learning Enabled Social Network? (LESN)”

A LESN is an eLearning environment that utilizes social network techniques and features in order to enable active and ongoing learning.

1.3 Area of contribution

The area of contribution lies in the online learning and social network domains. Online learning or eLearning is the fastest growing form of education in the world. This has lead to many online solutions being created which try to facilitate the educational needs of learners. There is however growing concern that traditional eLearning solutions are falling short in enabling learners to fullfill their learning objectives. Action needs to be taken in order to further solidify the eLearning experience. Combining eLearning with a social network helps bring learners offline relationships into the online realm permitting the creation of community, social presence and collaborative knowledge generative. All of which are key to a successful learning experience.

2. Literature Review

2.1 Introduction

This chapter is concerned with the current research and understanding of Social Networks and Learning Enabled Social Networks. A brief history of SNS's is presented along with its main characteristics. Following this the LESN is explored, presenting us with its characteristics and differences to an SNS. We then explore the idea of online community, what its traits are and how important it is. Collaboration is then examined, exploring why it is important and what outcomes it has. Finally the design of the SNS and LESN will be reviewed leading to the optimal formula of design elements that best suit a LESN.

2.2 Social Network Sites (SNS's)

This section discusses the SNS exploring its history and defining its main characteristics. The SNS is a powerful device that can be used to represent virtual applications of real world constructs.

2.2.1 What is an SNS?

In their seminal 2007 article "Social Network Sites: Definition, History, and Scholarship", Boyd and Ellison [1] define a social network site to be web-enabled services that *"allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those*

made by others within the system". Robinson-Combre, Berge and Kane [3] further expand on what a social network is by describing it as a *"user-friendly, user-generated environment"* that *"fosters collaboration and cooperation".*

These definitions best describe the qualities and ideals of a SNS. It can be seen as an online way to maintain and develop offline relationships while seeking out and starting new ones.

2.2.2 A brief history of the SNS

Boyd and Ellison [1] Gibson [2] and Howard [10] describe the history of Social Network Sites briefly. Sixdegrees.com which launched in 1997 was the first recognizable SNS that comprised features typically associated with sites today such as profile creation and friend listing. Figure one depicts Boyd and Ellisons timeline of major social network launches.

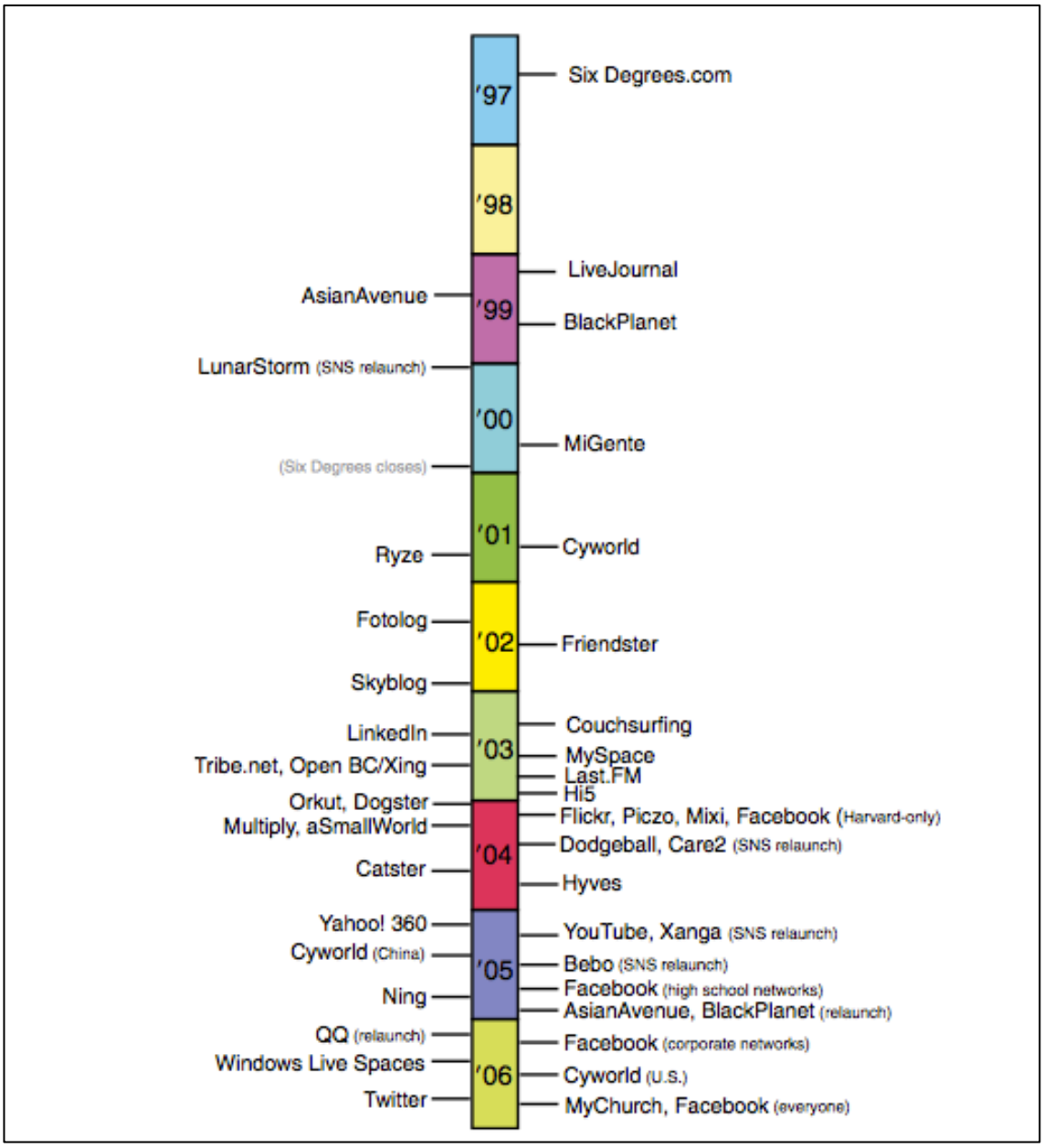

Figure 1: Boyd and Ellisons [1] timeline of SNS launch dates

There are now hundreds of web applications that can be classed as SNS's. From 2003 on an explosion in the creation of SNS's occurred leading to many analysts coining terms such as YASNS (Yet Another Social Networking Service). It was after this time that some of today's largest SNS's were created, Facebook [16], Twitter [17] and YouTube [18], building upon the experiences offered by SNS's in

the past and offering new avenues of communication provided by Web 2.0 technologies.

In their 2009 report Nielsen [19] describes the rate at which social network sites are growing. The SNS sector is growing three times the rate of the overall Internet. From the report it can also be seen that *“Social network and blogging sites are now the fourth most popular activity on the Internet”,* underneath software manufacturers, online interest portals and general Internet searching but above email. The fact that SNS’s are now more popular than email means that users of the Internet prefer to conduct their communications through social networks instead of traditional emailing services.

2.2.3 SNS Characteristics

Through the course of SNS history a set of characteristics have become synonymous with the type of application. These general characteristics provide a sense of familiarity to the user when encountering different SNS’s.

Boyd and Ellison [1] and Hargadon [4] determine the general characteristics and criteria for an SNS to be:

- Public persona
    - The public persona of a user is a unique page where one can *"type oneself into being"* Boyd and Ellison [1]. These pages are otherwise known as profile pages. They serve a great purpose in the SNS as the users profile is a virtual representation of a physical being. This page conveys to other users of the SNS who you are, what your

interests are and what kind of personality you have. It also serves as a hub of information presenting to other users your contributions and participation in the SNS as a whole including the connections you have made.

- Relationships

    - Seeking out and solidifying online relationships with others is a key part of an SNS. This process otherwise known as friending allows the user to search the network of users for other users they know or would like to know. Usually a bi-directional process of friending occurs in which both parties must agree to be friends before the connection is established. Listing the connections a user has made is a crucial part of an SNS as it enables “viewers to traverse the network graph by clicking through the Friends lists” Boyd and Ellison [1].

- Community Driven

    - An SNS is built upon real world community interactions and as such members have related interests or beliefs. Smaller communities develop which share a more specific belief or interest. These smaller communities or groups and lesser versions of the SNS network as a while. These provide the means for existing relationships and connections to expand, which in turn allows for new connections and relationships to be created in a more defined interest area.

- Communication

- Without effective means of communication an SNS would quickly fall into decline. The communal aspects of the SNS require that optimal communications be provided to users at all times in order to promote interactivity and boost the sense of community created by the SNS. Different forms of communication are apparent such as posting comments on users posts, directly communicating with other users through public and private messaging, instant messaging and discussion threads. The rich communication that should be provided by an SNS reinforces community as well as reinforcing the bond between users of the system.

The characteristics of the SNS are virtual representations of real world constructs. The public person is the users identity and is as important online as it is offline. Without a sufficient outlet for self-expression a public persona will become stagnant and generic. The social and personal relationships between users of an SNS mimic those found in the real world. A proper reflection of this interaction is necessary in defining an appropriate social network. Without these characteristics an SNS cannot be defined as such.

2.3 Learning Enabled Social Networks (LESN's)

2.3.1 What is a LESN?

A Learning Enabled Social Network (LESN) employs the benefits, characteristics and communal aspects of an SNS but is based on the concept of social learning. Reynard [5] describes social learning as *"any learning that occurs within a group, organization, or cultural cluster, and includes: the procedures by which knowledge and practice are transmitted across posting cycles, across different*

work situations and across time". SNS tools can be used in order to promote social learning.

Bartlett-Bragg [6] discusses the emergence of LESN's. Recent developments and web-based software are enabling people to create communities online and participate in personal publishing. These developments are bringing more people together to collaborate, share, learn and build on their existing knowledge. Bartlett-Bragg also describes how people's relationship with knowledge is changing from one of *"passive-consumption from static web pages to active engagement with content and social interactions with other learners".* This change from passive consumption to active engagement is a sure sign that the way in which we learn online is changing. It is through the development of new interactive and communal mediums that the most optimal form of learning engagement can occur online. LESN's are "Convenient to access from different locations and time zones and fosters research and writing skills as written communication is the primary mode of communication" Robinson-Combre, Berge and Kane [3].

There are instances in which using a LESN is not appropriate. Allen [37] notes these instances saying that *"teaching interpersonal skills"* and *"original thinking"* are not well suited topics for a LESN environment. These topics require a deeper level of personal communication such as the ability to analyze and view body language, something not possible in an online environment.

The LESN is an important and influential tool in the development of an online learners learning abilities. Its features and design can help an online learner fully realize their learning, social and creative potential.

2.3.2 Characteristics of a LESN

A LESN builds upon the structure and features provided by an SNS. Community, relationships and collaboration are key aspects of a successfully implemented LESN. One of the most influential characteristics of the LESN is a *"platform that extends simple individual actions, to links that connect people for a common learning goal, to connecting learners with others beyond the boundaries of their current learning contexts"* Bartlett-Bragg [6]. This fostering of a community of learning fuelled by learner interactions and contributions produces a product that is both beneficial and alterable.

Bartlett-Bragg further describes the LESN by saying they shift away from strict knowledge organization. This allows the learner to personalize and restructure knowledge for their context and with great flexibility to reflect on and update whenever relevant to the learner. Bartlett-Bragg also notes *"learners, who are connected in an online format feel greater sense of community and have perceived higher levels of learning satisfaction".* Greenhow [8] also perceives this finding from their research. This characteristic of community is key to forwarding interactive discussion, knowledge creation and collaborative sharing. Hargadon [4] also agrees with the restructuring of knowledge saying that it can now be stored, managed and shared easily through a LESN.

The social structure of the LESN is another characteristic that is crucial in creating a LESN environment. The learners in the network of this structure can be classified as readers and writers, absorbers of and generators of content. This social structure supports the development of an *"ecology of connections"* Bartlett-Bragg [6]. This ecology organically grows the more a learner participates in and utilizes the content being generated by the LESN.

Bartlett-Bragg [6] describes the assumptions that are used in creating a LESN. These assumptions say that online learners:

- Want to communicate and collaborate with others
- Enjoy sharing their ideas with like-minded people
- Will openly share their experiences
- Look for recommendations and feedback from trusted resources
- Will create their own contextual knowledge by self-publishing
- Will manage their own learning by subscribing to information that is relevant to their context

Bartlett-Bragg [6] also describes how collaborative publishing is an extremely important part of the LESN and sits at its core. Actively creating knowledge allows the learner to clearly articulate their thoughts on a subject. The ability to review others work, share and reflect on content inspires learners to be enabled in active discussions to further generate knowledge.

In his paper Hargadon [4] says that the three R's, Reading, Writing and Arithmetic have been replaced by the three C's, Contribution, Collaboration and Creation in terms of the LESN. The three C's are the base concept onto which the LESN can be created upon.

Greenhow [8] describes some of the social learning characteristics associated with LESN's, these functions include:

- Obtaining validation and appreciation of creative work through feedback
- Peer/Alumni support
- Help with learning related tasks

Greenhow [8] further discusses these functions. They can take several forms such as chatting online to other learners about a subject, asking public questions, planning study groups, requesting additional help with a certain topic, brainstorming, sharing written work and exchanging feedback. These functions seek to enhance and reinforce the community and provide additional support to other learners who may require the same learning requirements.

The three C's, Collaboration, Contribution and Creation best describe the core ethics and concept of a LESN. These functions seek to transform a learner's knowledge into something that is beneficial to many and essential in the development of other learners. Participation and trust between peers will provide fuel to the network for expansion by extracting and solidifying knowledge for all to see and share. A LESN provides the key ingredients for effective online learning.

2.3.3 Differences between SNS and LESN

Hargadon [4] describes that a LESN should have:

1. The ability to collaborate with others synchronously as well as asynchronously.
2. The ability to create a personal profile built specifically around educational and curricular specialities and interests, making it easy to find people, resources, events and discussions around that same categorization scheme.
3. The ability to easily find, store, manage and share content

He explains that these three features help to define LESN's separately from SNS's and that combined together create a network that uses the best features of an SNS and distinctly shifts the ideology from an SNS to that of a LESN.

2.3.4 LESN Examples

The following table lists examples of LESN's that exist today along with some of their features.

Application Name	Description	Features
MentorNet [20]	MentorNet is an application that seeks to match students with mentors in different fields and provide an online learning experience.	• Social Networking • Social Learning • Online Community • Collaboration and different methods of Communication
Ning [21]	Although not a pure Learning Enabled Social Network by default, Ning allows for the creation of online communities and social networks around specific interests.	• Social Networking • Content creation and collaboration • Customization
Classroom2.0 [22]	Classroom2.0 was started in 2007 by	• Social Networking • Content creation

	Hargadon [4]. It is a social network for educators that are interested in using web 2.0 in education. Classroom2.0 is powered by Ning [21].	and collaboration • Customization
Blackboard [23]	Blackboard is a virtual learning environment and course management system for educational purposes.	• Social Networking • Content management • Content creation and collaboration • Customization

Table 1: LESN Examples

There are also a range of applications available that are implemented through some of the most popular social network sites Twitter and Facebook. These applications have some excellent academic merits. Table 2 presents a list of some of these applications.

Social Network	Applications
Twitter [17]	Twitterfall.com [24] This application allows for a keyword search term to be entered and any tweets concerning that keyword will be returned in real time. This can be used

	to track current events in an academic environment
	Twittervision.com [25] Twittervision visualizes the locations of tweets based on topics. This again can be useful in an academic environment for monitoring events.
	Historicaltweets [26] Historicaltweets allows a student to take on the guise of a historical figure and post tweets as that person. This application is very useful in an academic environment as it can insight much debate and interest in history.
Facebook [16]	Wordbook [27] Wordbook is a Wordpress [28] plugin that allows users to bridge the gap between Wordpress blogs and Facebook. When a user uploads a blog post to their Wordpress blog it will automatically appear on their Facebook wall sharing the content with the users friends.
	Blackboard Sync [29] Blackboard sync connects a users

	Facebook account with their Blackboard account allowing them to access Blackboard course information directly from Facebook.
	Worldcat [30] Worldcat is a Facebook application that allows users to search for books and other library related materials through Facebook.

Table 2: Popular social network academic applications

2.4 Online Community

Community is an integral part of the LESN. It is through community and the sense of belonging that it offers which entices users to become active participants in the communities' activities.

2.4.1 Community of Inquiry

Garrison and Anderson [31] define the community of inquiry, it *"is a group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding".* The community of inquiry is a theoretical framework that is the embodiment of a process dedicated to creating an effective educational experience. Garrison and Anderson [31] also explain that the *"underlying foundational perspective of the framework is a collaborative constructivist view of teaching and learning"* meaning that *"a community of inquiry is a personal and public search for meaning and understanding"* Cleveland-Innes, Garrison and Kinsel [32]. This framework

consists of three interdependent elements - social, cognitive and teaching presence.

1. **Social Presence** is *"the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities"* Garrison [33].
2. **Teaching Presence** is *"the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes"* Anderson, Rourke, Garrison and Archer [34].
3. **Cognitive Presence** is *"the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse"* Garrison, Anderson and Archer [35]

Figure 2 depicts the community of inquiry framework along with its three interdependent elements and how they fit together.

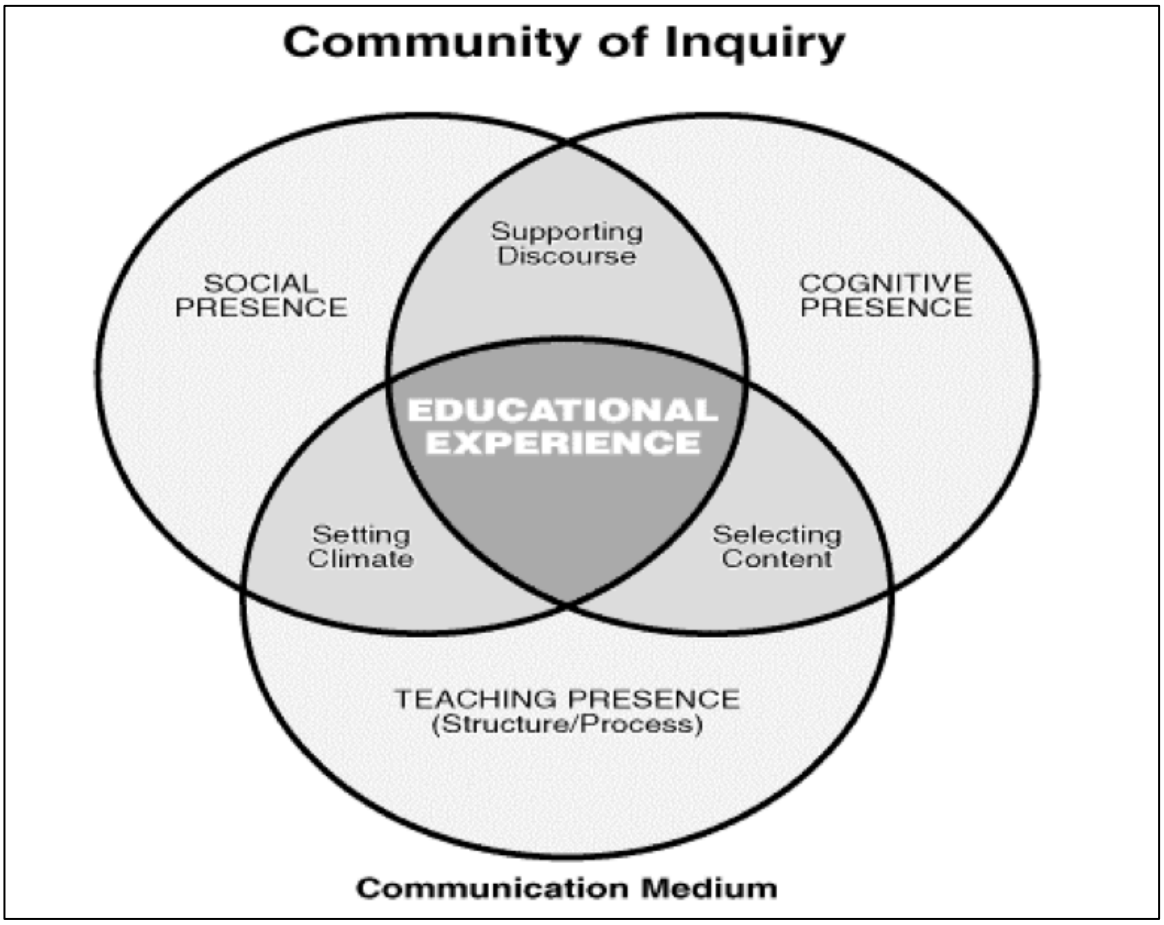

Figure 2: Community of inquiry framework. Zehra Akyol, D Randy Garrison & M Yasar Ozden [36]

2.4.2 Community and Social Presence

Social presence is a key principle in the creation of online community. Palloff and Pratt [9] discuss recent studies that indicate that social presence or the feeling of community has *"contributed positively to learning outcomes and learner satisfaction".* They also note that social presence can be divided into three dimensions, social context, online communication and interaction. These three dimensions of social presence are required when creating successful online learning communities. Palloff and Pratt also discuss previous studies that

reinforce the idea of social presence indicating the “use of asynchronous online collaboration increased learner interaction, satisfaction and learning”.

Palloff and Pratt [9] further explain the importance of social presence and learner satisfaction saying that collaboration not only enhances the learners learning outcomes but also reduces the risk for learner isolation that can occur in online communities. This lack of isolation allows the learner to increase their learning experience, share ideas with like-minded individuals and receive critical feedback that further lets the learner grow in terms of intellectual capital and confidence within the online learning community.

Garrison [13] also describes the merits of social presence saying that community takes time and direction to form but when it does it is an extremely *“powerful learning catalyst and support”.* Reflection, discourse and collaboration are key components of any successful online learning community and without these the community would collapse. According to Garrison, the ultimate goal of an online learning community is to create a community *“where learners are fully engaged and responsible”.* The power behind social presence can be used to achieve this goal.

Conrad and Donaldson [12] discuss the importance of collaboration in online learning communities, *“The collaborative acquisition of knowledge is key to the success of creating an online learning environment”.* Conrad and Donaldson also describe how a deeper level of thought is reached when learners are encouraged to share ideas and interact in a collaborative manner. Their social presence is used here to provide new and ever changing information to other like-minded learners.

2.4.3 Online Learning Community

Wenger [11] discusses issues of education and how they need to be addressed in terms of identity and modes of belonging. These two elements are vital influences in the fostering and creation of community, whether online or in the real world. From this we can see that the social aspects of education are the most important ones. Wenger goes on to describe education and how its real value lies in social participation and active involvement in community. We can see here again how the three C's are fundamental to the formation of successful social learning.

The definition of online community has changed somewhat since the early days of the Internet. Palloff and Pratt [9] describe this change from a more random collection of individuals that meet online to a more structured place that contains certain features in order to help people interact and coalesce into a community. They believe that it is *"engaging in collaborative learning and the reflective practice involved in transformative learning"* that differentiates online learning communities from other communities.

This distinct definition between online communities and online learning communities allows for a process to be developed that can define the requirements for an effective learning community experience.

According to Palloff and Pratt [9], it is *"social identity that drives learning".* They discuss research carried out in communities, both online and face-to-face. This research shows that communities *"are formed around issues of identity and shared values".* These issues lead to the creation of a sense of belonging, a sense of community.

Garrison [13] describes an online learning community as being an environment that *"reflects a group centered interaction pattern versus an authority centered pattern".* This means that an online learners needs are becoming more social rather than isolated.

In fostering online community in the context of an online learning community it is necessary to take into account the learners requirements. A willingness to participate in communal learning and activities is key to the success of the online learning community. A sense of belonging is an important factor in enabling learner interaction on a continual basis and it is this social participation that drives the learning community ever forward.

2.4.4 Social networks compared to Online Communities:

A simple comparison between social networks and online communities can be made. This comparison is presented in table 3.

A Social Network:	An Online Community:
• Has an organizational structure focused around an individual user's one-to-one relationships • Has weak secondary connections between members • Allows its users to be members of many communities in the	• Has an organizational structure focused around a shared purpose rather than one-to-one relationships • Has strong, predictable secondary relationships among members • Is distinct from other

network at the same time • Is good for sharing activities • Is less effective at activities requiring cooperation and collective action • Makes it easier for users to build communities	communities because of differences in purpose, policies, and computing environment • Is good for activities requiring sharing and cooperating • Is effective at providing the framework for activities requiring collective action • Should not be confused with "adhocracies," "discussion groups," "forums," or "lists"

Table 3: Social networks compared to Online Communities. Howard [10].

2.4.5 Elements of Community

Palloff and Pratt [9] best describe the elements of a successful community. These include:

- People
- Shared purpose
    - Learners coming together to share ideas, interests and resources
- Guidelines
    - Create ground rules for interaction and participation
- Technology
    - Serves as a place where everyone can meet

- Collaborative Learning
    - This promotes learner to learner interactions and supports socially constructed meaning and knowledge creation
- Reflective Practice
    - Promotes transformative learning

It is these elements that provide a valid point for a community to form upon. These features allow for a learners social presence to be achieved and for the collaborative and communicative nature of the community to be fully realized.

2.4.6 Why build Social Networks and Communities?

The reasons and benefits for building social networks and communities are numerous. Howard [10] best describes these reasons and benefits. They include:

- Enhancing and sustaining your “intellectual capital”
- Increasing creativity and cross-fertilization
- Improving decision-making processes with “epistemic communities”
- Preserving institutional knowledge
- Providing a higher quality interaction
- Improving retention and loyalty
- Reducing training and support costs
- Reducing travel costs and addressing problems “just in time”
- Flattening organizational hierarchies

2.4.7 Sustaining Community

In order to sustain an online learning community simple participation is not enough, Palloff and Pratt [9]. It was found that some students enjoyed synchronous communications in which to further solidify their social presence and the effectiveness of the community as a whole. These synchronous communications such as live chats can be used as a means to build community. By providing such instant messaging features greater discourse can be achieved allowing for deeper thought on topics and ideas. This also serves to foster community as it allows learners to get to know each other more intimately.

Using synchronous communications should not be the only way learners interact with each other. The promotion of active asynchronous discussions is the best way to support learner interactivity and develop the online community. When learners begin to interact online they will continue this interaction that further develops the community.

2.5 Online Collaboration

2.5.1 Collaboration Overview

Collaboration is one of the fundamental characteristics of LESN's. Its implementation helps reinforce the formation and survival of online learning communities and strengthens the learner's social presence.

Noonan [14] discusses online collaboration and how it can be used to boost personalized learning. Collaboration tools such as web conferencing have been judged on their economic benefits not the benefits to the users. This type of

collaboration reduces travel costs as users can partake in the collaboration from any location with Internet access. She goes further to say that there is a much broader application for collaboration in the area of eLearning. The active nature of collaboration can be used to enhance a users specific knowledge base rather than just impart some general information gained from traditional static sources. *"It provides a range of tools to suit individual learning requirements, habits and styles and enables maximum interaction and response through the most appropriate communication medium."*

Noonan [14] also gives an excellent example of when collaboration could be used. In an organization for example most staff would need to learn about the companies operations and functions. In this case collaboration provides a range of opportunities for interaction and knowledge generation. It enables instruction to take place online with real time sharing of technical expertise. This *"one to many teaching replicates and enhances established face to face teaching and training practice, by getting beyond traditional geographical, cultural and technological barriers"* Noonan [14].

The use of other multimedia technologies such as chat allows for greater interaction during collaboration Noonan notes. This enables a one to one learning experience and deepens the level of communication possible between two individuals.

Online collaboration and communication enables learners to access *"dispersed knowledge in a highly interactive way"* Noonan [14]. It is this feature of collaboration that best suits the purposes of a LESN.

In their 2005 book, Palloff and Pratt [15] describe in detail online collaboration. It is their opinion that online collaboration promotes:

- Development of critical thinking
- Co-creation of knowledge
- Reflection
- Transformative learning

They go further by saying that a sense of community or social presence needs to exist in order for collaboration to occur. It is the sense of community that can promote and further the use of collaboration. There is a strong relationship between the two. *"Collaboration supports the creation of community and community supports the ability to collaborate".*

Collaboration is a powerful force that can decide whether a LESN is successful or not. If enough action is not taken to fully realize the potential of collaboration the LESN will not grow enough to make it a viable option to learners. It is through the implementation of such a communal and collaborative environment that the learners learning outcomes can be met while also instilling in them new confidence in their own abilities as learners.

2.5.2 Online Collaboration Principles

Garrison [13] discusses the principles of online collaboration. These include:

- Establish a climate that will create a community of inquiry
- Establish critical reflection and discourse that will support systematic inquiry
- Sustain community through expression of group cohesion
- Encourage and support the progression of inquiry through to resolution

- Evolve collaborative relationships where learners are supported in assuming increasing responsibility for their learning

These principles when adhered to can create a truly successful and well-designed LESN that supports and encourages learner engagement on different levels.

2.6 LESN Design

The design of the LESN is paramount to its effectiveness as a tool of learning. The structures upon which it is based are inherited from the SNS and eLearning design domains, combining them in a way that feels natural and effortless to the online learner.

2.6.1 Socio-Technical Design Features

Greenhow [8] discusses the socio-technical features of popular SNS's such as sharing of micro-content, social searching, frequent updating, ratings and recommendations. These features should be incorporated into the LESN because the expectations of the online learner are extremely important. Online learners are *"expecting their experiences of social computing to enable the same sorts of interactions and networking functions they can access at home"* Bartlett-Bragg [6]. It is this familiarity of function and design that will provide online learners with an instant knowledge of how the application works and what its limitations may be. Care should be taken as to not alienate the learner.

2.6.2 Effective LESN Design

The effective and successful design of an LESN is a complex problem. Creating and *"designing effective eLearning is part art and part science"* Allen [37]. It requires a *"blend of color, style, sound and video usage in a manner that educates while entertaining the student without distracting from the learning experience"* Steen [38]. Steen further explains that *"there is no one-size-fits-all approach to the design of eLearning"*. There is however a general process by which a balance can be created between the different aspects of the design such as learner differences, goals and the learning environment.

Allen [37] discusses the educational theory of psychologist William Glasser [39]. Glasser says that we learn:

- 10% of what we read
- 20% of what we hear
- 30% of what we see
- 50% of what we see and hear
- 70% of what we discuss with others
- 80% of what we experience
- 95% of what we teach someone else

According to Allen, if the design of the LESN is based on this scale then combining learner interactivity with personal involvement could potentially deliver the highest learning experience possible. Taking into account this scale and incorporating its benefits into the design of the LESN we can produce a product that is effective and truly benefits and supplements the online learners learning experience.

Angeliki, Asimina, and Eleni [40] discuss the characteristics of effective LESN design. A fully implemented and effectively designed LESN should be:

- Successful in reaching learning objectives
- Easily accessible
- Present a consistent and accurate message
- Easy to use
- Entertaining
- Memorable
- Relevant

Steen [38] goes further to say that not all these characteristics are necessary in creating an effective design. It is up to the designer of the LESN to balance the various different factors in order to create an effective and lasting learning experience.

A successful method for designing a LESN is discussed by Steen [38]. This method, called “Successive Approximation”, is an iterative approach to design that repeatedly runs through three steps: design, prototype and review. This process is highly effective at creating prototypes of the LESN quickly. This allows for greater focus on learner input, what their requirements are and how they can be implemented in the LESN environment. Steen also notes that an artistic approach is also necessary in correctly blending the different presentation methods of the LESN, ensuring that the interface does not take away from the content being presented.

The design of the LESN is a multifaceted process that needs to take into account many factors. An effective design will incorporate the best components that are suitable for the online learner. It is only when these components have been properly and fully implemented that the LESN will be an effective tool in delivering an adequate learning experience.

2.6.3 Social interface design features

There are several aspects of interface design that need to be taken into account when designing for a social application. Cronin [43] describes crucial user interface features of social media and networking applications.

2.6.3.1 Simple interface is the key

Cronin notes *"simplicity in user interface is a shared characteristic of social media and networking websites".* Color and graphics are used sparingly and in the correct places. The reason for this Cronin discusses is because *"vivid visual design isn't really useful on social networking sites"*, a strong visual design would distract the user from the task at hand by creating unnecessary visual noise.

2.6.3.2 Prominent and functional search

Search functionality is an essential requirement for an SNS. This is due to the large amount of data present in any SNS. Without a strong and efficient search feature users would soon become lost and unwilling to spend time manually wading through information in search of what they are looking for. The position of the search box is also important. The upper right corner of the application is seen as the most suitable location as users generally expect it to be located in this

position. A live search feature is also highly desirable as results are returned immediately without the need for submitting a form. This improves the users experience by allowing them to perform a search from any page and remain on that page to analyze the results.

2.6.3.3 Calm separation of elements

The presentation of content is an important element of social interface design. It is important to ensure that content is readable and easily perceived by the user. Cronin notes *"content blocks need to be visually separated"*. Each element needs to be defined and presented separately. This separation produces a more clean user interface that promotes ease of use.

2.6.3.4 Simple and usable forms

Forms are seen as one of the most important elements of the social interface. Without them communication could not take place so therefore they need to be optimally designed. Cronin believes that one of the easiest ways to keep forms usable is *"keeping it as short as possible"*. The fewer fields there are to fill out will encourage active usage of the application. For instance, when providing a sign up form for users only necessary information should be required such as email address, login and password. All other information such as name and bio should be removed to another form for users to update when they see fit.

2.6.3.5 User-centric user interface

This feature might seem obvious but it is non the less extremely important. A social application is social and therefore it should be deeply concerned with the

user and be egocentric. The user should be placed at the center of the application allowing them to focus on their involvement with the SNS such as gaining new friends and participating in active discourse amongst other activities. A concise stream of information should be presented to the user that summarizes the recent history of their and their friends' activities. This again places the user at the center of the application because engaging the user is extremely important.

2.6.4 Design trade-offs

There are many key design tradeoffs that arise when incorporating social networking technologies with eLearning to form a LESN. Halverson [41] discusses these tradeoffs, they are:

2.6.4.1 Privacy versus redundancy

This trade-off examines the importance of privacy and how the threat of redundancy can be overcome. Redundancy in the case of the LESN is concerned with the uptake of the application. If the online learner does not engage well with the system then it will become unused, derelict and redundant extremely quickly. The more removed the LESN is from the online learners everyday SNS experiences the more hesitant the learner will be in using the LESN. Care must be taken in designing the LESN to ensure that typical SNS features are available to the online learner as to not alienate or frustrate them.

Privacy in formal learning environments is extremely important and often the number one concern of teachers. The design of the SNS is such that the level of privacy afforded is determined by the user. In order to incite uptake of the LESN

a robust privacy control needs to be designed in order to protect the online learners and their content. If the privacy offered is seen as sub standard then the threat of redundancy will become an ominous possibility.

2.6.4.2 Endogenous versus exogenous learning goals

According to Wenger [11] *"the sociocultural turn in research on how people learn has framed learning as an ongoing process, rather than a discreet activity that happens when other activities do not"*. A formal learning environment is designed with specific learning goals in mind. These are exogenous goals and are more often than not different than the endogenous goals of the SNS. To create a successful blend between social network technologies and formal learning a tie needs to be made to the attainment of learning goals. There are some features of SNS's that can support learning goals such as sharing, collaboration and active discourse. A determination needs to be reached in incorporating features into the LESN and how participation with these features may be endogenous to learning goals. This determination could then solve this trade-off.

2.6.4.3 Identity versus identity

A person's identity is an extremely important facet of the SNS and LESN. Halverson [41] describes identity as *"a persons psychosocial understanding of 'who they are'"* and that it is *"accomplished as participants 'try out' and explore identities through the production of online content, including SNS pages".* The identity of the learner in the online learning environment differs to that of the formal learning environment. In the formal learning environment identity tends to focus on *"identity as"*: identity as scientist or identity as student for example. Halverson also notes *"identity is the same regardless of the situation within the*

context of an SNS". Even though the online identity is alterable by the user, it remains consistent across situations.

In order to bridge the gap between the formal learning identity and online learning identity learning environments should *"leverage participants' ability to play with identity as a broad, psychosocial construct of selfhood, rather than the 'identity-as student' in a specific content area, classroom setting, or professional practice"* Halverson [41]. This could then address this design trade-off.

These design trade-offs need to be considered and rectified in order to create a successfully implemented and viable SNS or LESN. It is only when these problems have been solved that user uptake and participation in the system will grow, allowing the application to become an effective and useful tool for the online learner to use.

2.7 Conclusion

This chapter was concerned with the current research and understanding of Social Network Sites and Learning Enabled Social Networks. The characteristics and history of the SNS were gleamed from the research along with the characteristics and history of the LESN. The relationship between the SNS, LESN and community was explored, shedding light on the community of inquiry model and how community is an important aspect of online learning. The importance of collaboration is also explored detailing why and how it is useful in the LESN environment. Finally the design of the LESN was discussed. The importance of design and which elements were best suited to the LESN were described along with some design trade-offs that need to be considered when creating an SNS or LESN. The LESN is a powerful and complex device that can provide extreme benefits to the online learner when all the correct decisions have

been made. The findings of this research detail what the components of and optimal design of a LESN are.

3. TwoBrains

TwoBrains can be divided into two distinct prototypes. TwoBrains 1 is the application upon which further research and development was conducted in order to produce a drastically updated and more fully implemented application known as TwoBrains 2. This chapter deals with TwoBrains 1 and seeks to define what TwoBrains 1 was before the second phase of development.

3.1 Introduction

TwoBrains is a Learning Enabled Social Network (LESN). TwoBrains enables the learner to become self-directed in their learning while maintaining and creating relationships with other learners online. The environment provides learners with typical Social Network Site (SNS) functionality, such as creating profiles and participating in active public discourse.

In addition to providing traditional social networking functionality, TwoBrains offers many features focused on the learners' educational experience. A learner can create notebooks and notes containing specific information. Notes and notebooks can serve as hubs for active discussion. The ability to create groups is also offered to learners. Creating a sub community around a more refined topic or idea stimulates like-minded learners to come together and share their content and experiences. A book search is also offered to learners in order to allow them to locate books they may be using in their studies. Searching for books and adding them to the personal or public library allows for a particular book to become itself a hub of information and discussion.

TwoBrains also offers intelligent functionality that yields new learning objects to the learner, for example TwoBrains contains functionality to automatically summarize a learners notes, providing them with a summary of the content along with some extra statistical information.

The name TwoBrains is derived from the adage “two heads are better than one”, which conveys the ideology of the application to the learner, a collaborative, social and intelligent information sharing system. It lies at the center of three different domains: social networking, eLearning and collaboration. Figure 3 illustrates TwoBrains and what domains it is inheriting from.

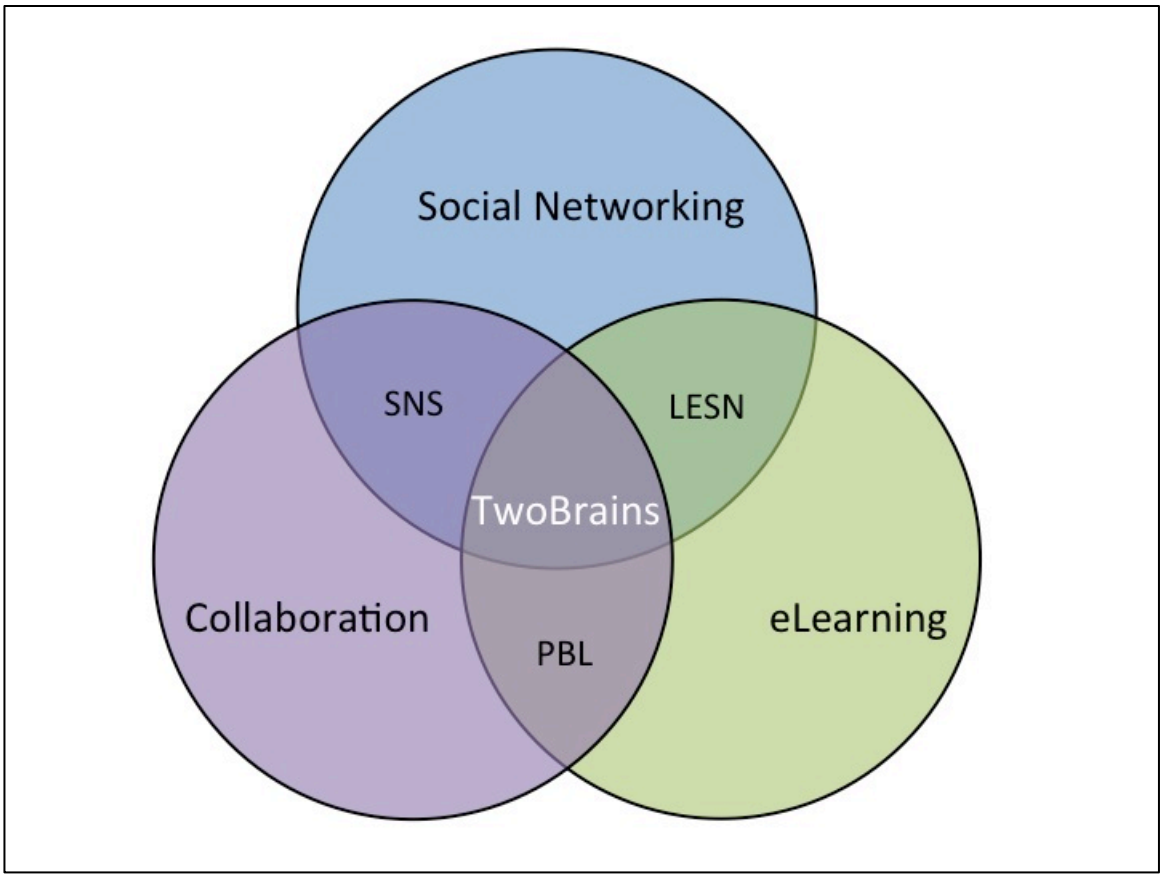

Figure 3: TwoBrains conceptual ideology

3.2 Motivation

The motivation behind TwoBrains arose from the lack of a proper support structure for combining the benefits of social network technology with eLearning. A gap was seen in the domains of online learning and social networking that could be filled by an application that could bridge the gap between both and provide users with a new process of educational attainment.

3.3 Key Aims

The aims of TwoBrains 1 were simple:

- Provide a simple to use application
- Allow users to interact with each other
- Provide key social network features
- Allow users to create content
- Provide users with means to participate in active discussion
- Incorporate intelligent functionality to generate summarizations of content
- Instantiate sub communities
- Search for and add books to a personal and communal library
- Provide a live search feature
- Provide email updates
- Provide the option of downloading content in PDF format

3.4 Scope

The purpose of this project was to cement into reality a Learning Enabled Social Network (LESN). This would include several social networking aspects, rich user interaction and a strong focus on usability.

3.5 Requirements Specification

The requirements of TwoBrains are many. Functional and non-functional requirements were decided upon before development of the system had begun. This foresight allowed for a strategy of development to be formed. Following this strategy it was possibly to create a feature rich and functional application is a timely manner.

The following two sections present the functional and non-functional requirements for TwoBrains 1, the initial iteration of TwoBrains upon which a new stage of development was based to create TwoBrains 2.

3.5.1 Functional Requirements

Requirement	Motivation and description
User creation, activation and login	The functionality centred around the user is an extremely important requirement. Without this the social networking aspect of TwoBrains would fail.

Profile creation and updating	This requirement gives the social networking side of TwoBrains a much more rounded and personalised feel. It gives the user a unique online identity which represents them and their activities in the application.
Friendships creation and updating	The friendship requirement also expands the social network employed by TwoBrains. This allows for personal connections to be created between users, further expanding the array of knowledge and information available to the user.
Notebook creation and updating	This is possibly the most important requirement of the system because without it the main ethos and structure of TwoBrains could not be implemented. Notebooks are houses for the information that can be shared amongst users which in turn will create new information. The notebook is the engine and central core of what TwoBrains is.
Note creation and updating	This requirement is equally as important as the notebooks requirement and shares the exact same merits. Without notes a notebook is just an empty shell longing for some meaningful information. The lack of this requirement would destroy the idea of TwoBrains and create an application without any proper focus or meaning.
Comment creation	Allowing users to create a comment and add

	it to a note is an important requirement. This allows for greater social interaction and provides other users with extra information concerning a note.
Book search and library addition utilising Amazon AWS	Being able to attach a notebook to a book is an extremely important requirement. This in itself would create a miniature hub of information all centred around the one idea. Using Amazon AWS will make the book search feature much more dynamic providing users with thousands of options that they can add to their personal libraries.
Book review creation	Allowing users to create a review and add it to a book is an important requirement. This allows for greater social interaction and provides other users with extra information concerning a book. Their unique opinions and ideas are conveyed in a direct manner.
Group creation and updating	This requirement further enriches the social side of TwoBrains. A group can be created around an idea or anything the user wishes. Books can be associated with the group, users can become members of the group and associate their notebooks with it. This creates another miniature hub of information which promotes user interaction and information creation.
Group small talk creation	A small talk is a simple group comment that

	can be seen by any user. This requirement promotes a user's interaction with the group which in turn can generate more information and knowledge available to the group.
Site wide search	This is an extremely important requirement. Users must be able to find the desired information in an extremely fast and simple way. An effective and direct search can promote a user's experience and give them access to more information than they might normally require. This can provide ways of expanding content and increase the users' interactions with the system.
Email updates	This requirement will keep the user informed of any important happenings with the system during times that they are using or are away from a computer. Emails are generated after certain actions and the appropriate users are informed of the new state of the system. For example when one of a user's groups gains a new member then they are informed of this by email.

Table 4: TwoBrains 1 Functional Requirements

3.5.2 Non-Functional Requirements

Requirement	Motivation and description
Rich and featured user help guides	This is an extremely important requirement as without it the user could be left confused as to what was happening or how to accomplish their task. Having rich and featured user help guides detailing all the major sections of the application and all its functionality will promote user acceptance and experience. The guides should provide the right information and detail situations where it would be applicable. These guides should also be easy to access and be available to the user at all times and all stages of the application.
Security	TwoBrains should be a secure application providing adequate encryption to passwords for example. Proper recognised implementations of changing password or retrieving a password should be adhered to in order to create a more secure system.
Usability	This requirement is very important. The application should be tested rigorously under usability guidelines and specifications in order to produce a fully functional and usable system.

Stability	The system should not cause faults of such a magnitude that a crash is caused. The stability requirement ensures that the user experience does not get interrupted and damaged by a system crash or error.

Table 5: TwoBrains 1 Non-Functional Requirements

3.6 Methodology

The software methodology is a process used to provide structure to the development phase of an application. Without this structure the implementation would quickly fall into disarray.

3.6.1 Rapid Application Development

Rapid application development or R.A.D is a software methodology that focuses on iterative development focusing on prototypes. Rapid application development is used to deliver applications rapidly. There are some situations however where this approach is not appropriate such as designing an air traffic control system for instance. There would not be much faith in such a complex program developed in such a short time.

Suitable projects for RAD are ones which have a focused scope and where the business objectives are well defined and narrow. Therefore using this methodology in the development of TwoBrains is acceptable as we already know the base functionality of the system.

3.6.2 TwoBrains prototype 1

The first prototype developed using the Rapid Application Development methodology was a simple beginning point to spawn the additional features. This prototype provided the basic interface for users to create an account with the system and then login/logout using their username and password. The functionality concerning notebook and note creation was implemented during the first prototype. Figures 4 and 5 show the very early prototypes of TwoBrains.

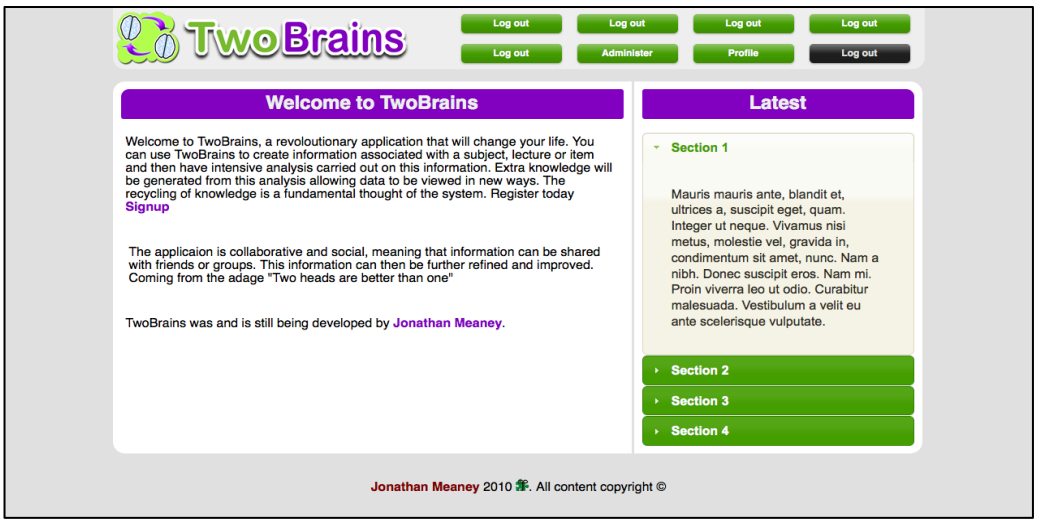

Figure 4: TwoBrains initial design and styling.

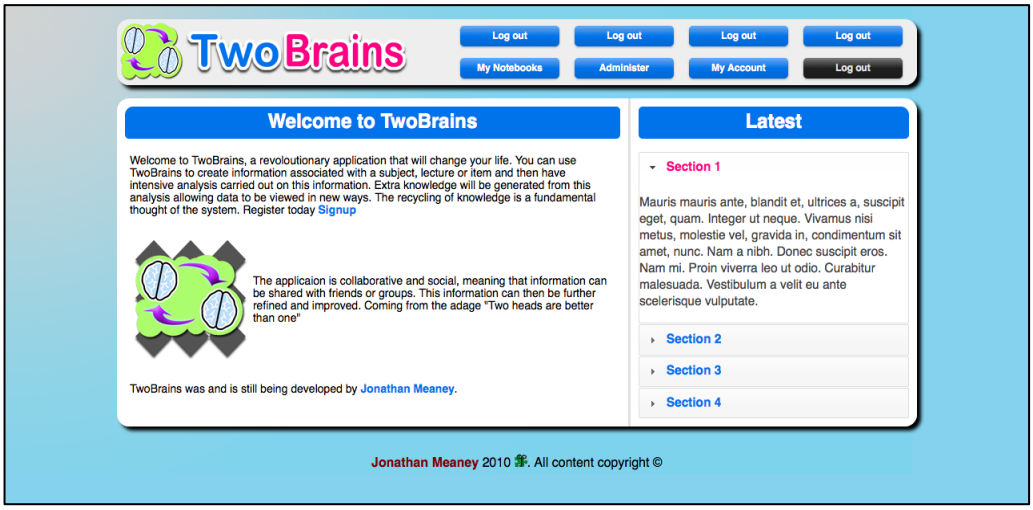

Figure 5: TwoBrains finalized look and feel.

3.6.3 TwoBrains prototype 2

The second distinct prototype of TwoBrains fleshed out the core functionality and added many new sections and abilities. This prototype implemented the book search and addition requirements along with the group creation and notebook subscription requirements. A dashboard was also implemented in order to allow users to control aspects of their experience in one view.

3.6.4 TwoBrains prototype 3

TwoBrains third distinct prototype added the text analysis and summarization features. These were brought about through the creation of a Ruby Gem. This gem was named “Summalyzer”, a joining of the words summary and analyzer, two words which best describe the gems functions. A live search was also implemented in this prototype allowing for a site wide instant search to be made. Finally an extensive email system was created to facilitate the flow of information between the applications users.

3.7 Development Technologies

TwoBrains 1 and 2 are developed using the same Web Application Framework there are some differences in technological implementation. This section discusses the technologies used in TwoBrains 1.

3.7.1 Frameworks

A web application framework is a software framework that aids in the development of dynamic websites. It can formalize and provide structure for common tasks of web development. Choosing the correct web application framework to suit the needs of the application will ensure that development can occur unimpeded.

3.7.1.1 Ruby on Rails

Ruby on Rails, often shortened to Rails or RoR is an open source web application framework for the Ruby programming language. It is intended to be implemented with an iterative and incremental development methodology such as the Rapid Application Development or Agile development methodology.

Like many of its contemporary web frameworks, Rails utilizes the Model-View-Controller architecture to organize application programming. Rails is an integrated framework that utilizes the dynamic nature of the object-oriented Ruby programming language. It is an extremely productive framework for database-backed Web applications and primarily uses conventions to avoid configuration when possible. Convention over Configuration (CoC) and the rapid development principle of Don't Repeat Yourself (DRY) form the basic philosophy and design of Ruby on Rails.

When you write a web application using Rails, almost all of the development is done through Ruby. Databases can be defined and accessed through Ruby. Embedded Ruby can be used in templates amongst HTML and business logic can be coded in Ruby. Rails is known for its ability to build Web applications

quickly and with ease. The rapid feedback loop is an excellent feature of the Ruby on Rails framework. This loop is basically the amount of time between making a change in code and seeing the results in the execution of your application on the screen. Feedback is nearly instant. There is no compile or packaging phase needed.

Rails' growth is not limited to the existing community of Ruby developers. It has pulled in converts from languages such as Java, PHP and Perl amongst others. The Ruby on Rails framework has served as a catalyst for incredible growth of awareness and use of the Ruby programming language. In the coming years it is expected to become an even more formidable opponent with new releases added even better features.

3.7.2 Toolkits, Libraries and Plugins

Toolkits, libraries and plugins can provide additional features and functions that a web application framework cannot. Using the correct blend of these different technologies will ensure that an application of sufficient functionality will be created.

3.7.2.1 jQuery [45]

jQuery is a cross-browser compatible JavaScript library and framework that is designed to simplify the client-side scripting of HTML. It was released in 2006 and has seen incredible growth and adoption ever since. It is free and open source which has lead to a large development community and a large extension development community also. jQuery's syntax has been developed to make it easier to navigate a document and easily select DOM elements, create

animations and handle events. It is an extremely powerful library that has revolutionized client side technology. jQuery UI elements are used extensively in order to produce certain aspects of the TwoBrains user interface.

Two main jQuery plugins were used in developing TwoBrains 1 interface. The TableSorter plugin [46] was used to enable for easy sorting of tables based on the tables different headings. The RoundAbout plugin [47] was used to create part of the group section user interface. The roundabout on the group show view presents the latest information concerning that group as an animated roundabout.

3.7.2.2 Restful Authentication [48]

Restful Authentication provides a foundation for securely managing user authentication in Ruby on Rails. It is a plugin and library that generates functionality for:

- Login / logout
- Secure password handling
- Account activation by validating email
- Account approval / disabling by admin
- Rudimentary hooks for authorization and access control.

This plugin allows for a quick start to be made in a user centric application. With some modifications extra functionality was added such as a forgotten password feature that emailed a link to the user with instructions on how to change their password.

The only information a user must give when creating an account is their login name, email and password. Other fields would be added to the user profile in order to create a quicker and simpler signup process.

3.7.2.3 Script.aculo.us [49] and Prototype [50]

Script.aculo.us is a web 2.0 JavaScript library built on the Prototype JavaScript Framework, providing dynamic visual effects and user interface elements via the Document Object Model. This library is included with the Ruby on Rails framework and as such provides an extremely rich variety of visual effects, utilities, user interface controls and functionality.

These libraries are used to provide visual effects in TwoBrains and also to provide certain elements with AJAX abilities.

3.7.2.4 Acts as Taggable [51]

Acts_as_taggable is a Ruby on Rails plugin provides the ability to add tags to any given model in the application. This is extremely helpful as it allows for a greater description of the items contents and meaning. It also allows for relationships between two similar items to be discovered. This plugin is used for notebooks, notes, books and groups in TwoBrains.

3.7.2.5 Acts as State Machine [52]

The acts_as_state_machine plugin for Ruby on Rails is implemented in the notebook and note models in order to create a basis for permissions. This plugin

uses the state attribute of each model and assigns an initial state of 'published' to all new notebooks and notes. These can then be changed to 'private' or vice versa from the listing views of notebooks and notes. States can also be changed from the individual show pages of each. Items that are private are only ever displayed to its creator and never anyone else.

3.7.2.6 Ruby AWS [53]

Ruby/AWS is a Ruby language library that allows programmatic access to the popular Amazon Web sites via the AWS v4 API. It provides many operations that allow interaction with the service. For TwoBrains only itemlookup and itemsearch were used. A prerequisite to using this library is that you need to obtain an Amazon Web Services access key ID.

Once all details and installations had been complete an interface to the plugin was created containing methods for searching by ISBN or keyword. This could then be used by the book model in order to carry out the search.

3.7.2.7 Delayed Job [54]

This Ruby on Rails plugin was utilized in order to increase system wide productivity and relieve strain. The delayed job plugin creates a table in the database into which it inserts tasks to be completed at a later date when a rake task is run. Delayed job was used in order to speed up the sending of emails to users. Individually sending emails was time and resource intensive, using this plugin allowed for emails to be added to the table and be sent in bulk to the various recipients freeing up needed resources needed for the operation of the rest of the application.

3.7.3 Ruby Gems

A Ruby Gem is a package that contains Ruby code to provide some functionality. These Gems are used to enhance a web application and provide additional features.

3.7.3.1 Tiny MCE [55]

The Tiny MCE gem can convert a text input box into a rich text editor allowing for the creation of complex styles and content. This gem is used to create a text editor for creating notes in TwoBrains.

3.7.3.2 Rails [56]

The version of Rails that was used was version 2.3.10. This version of the Rails gem was seen as a highly stable option. The version of Ruby used with Rails was version 1.8.6.

3.7.3.3 Will Paginate [57]

This extremely helpful gem paginates content. With some further modifications will paginate produced AJAX pagination. This feature was used for tables and large lists of content where limiting the amount of information displayed was necessary. The addition of AJAX improved the user experience by allowing users to update the content displayed without refreshing the page.

3.7.3.4 Prawn [58]

Prawn is a fast, nimble PDF writer for Ruby. It can be used to convert text into a PDF document that can then be downloaded by the user. The conversion of text into PDF is used in the notes and notebooks sections of TwoBrains. There are options available to the user to download a single note or entire notebook as a PDF document.

3.7.3.5 Summalyzer

The Summalyzer gem was created in order to facilitate the summarization and statistical analysis of text in TwoBrains. It will accept text, run an analysis, generate a set of descriptive keywords and they summarize the text based around the generated keywords. Other information is also generated such as word count or average sentences. This gem is used during the note creation and update methods.

3.8 TwoBrains Design

This section discusses the design and layout of TwoBrains. This process was directly involved with creating a highly usable and attractive interface.

3.8.1 Design and Layout

The concept for the design and layout of TwoBrains was to style the application in a way that promoted usability and ease of use. Using the mathematical and artistic golden ratio the main layout aesthetics were formed. The golden ratio

states that *"a+b is to a as a is to b",* using this formula a two column main content area was created with dimensions produced from the golden ratio. This created a large content area with a smaller content area next to it. Eventually this would be used to display primary information along with secondary information.

The navigation of the application is an extremely crucial element as it helps users know where they are and what they can do. A multi-purpose navigation bar was created and placed at the top of the page. Before a user logs into the system they are presented with a login form and upon successful login this form converts into the navigation area offering direct links to the main sections of the application. Depending on which section is currently in operation the corresponding link will be highlighted indicating to the user where they are.

A sub navigation menu system was also implemented to allow for greater application access. Attached to the top of the main content area are dynamic tabs that change depending on the functionality offered by the current page. These tabs also remain highlighted when active to alert the user to where they are.

In between the main and sub navigation menus lies the live search box. This box allows a user to do an application wide search for information. The results are returned to them on the same page in an unobtrusive manner allowing them to carry on with what they are doing without interruption.

Implementing table layout was a labor-intensive task that required several levels of design in order to produce an acceptable method of conveying content to the user. Tables can be sorted by their headings and display various different pieces of information to the user. When a row in the table is hovered over a new set of

actions appear for that row, these actions can contain: information, show, edit or delete. The actions displayed are dependent on the content of the table.

In several of the views inside the secondary content area there is implemented a floating box that follows the user up and down the page. Upon selecting some specific action on the page this box will update dynamically with new information concerning the selected action. This allows for greater access to knowledge by the user and provides new functionality in certain circumstances.

The use of special effects is a key area in promoting usability. They are employed throughout TwoBrains in order to increase the user experience. For instance user interface elements that are not always used are hidden and only come into view when the user wishes. They are also used to alert users to dynamic changes on the page such as new information being injected or created.

The color scheme for TwoBrains was chosen after extensive trials. The final decision was a palette of light blues and grays that do not cause any eyestrain. This promotes the usefulness of the application as it does not cause the user any discomfort in using it. A strong pink was also used to provide some contrast in dividing up different areas. This contrast served to tie the theme as whole together.

The target audience for TwoBrains is quite wide. Anyone can use the system but it may appeal to students or professionals more. Figure 6 shows the final vision for TwoBrains 1 style, in particular the homepage in this figure.

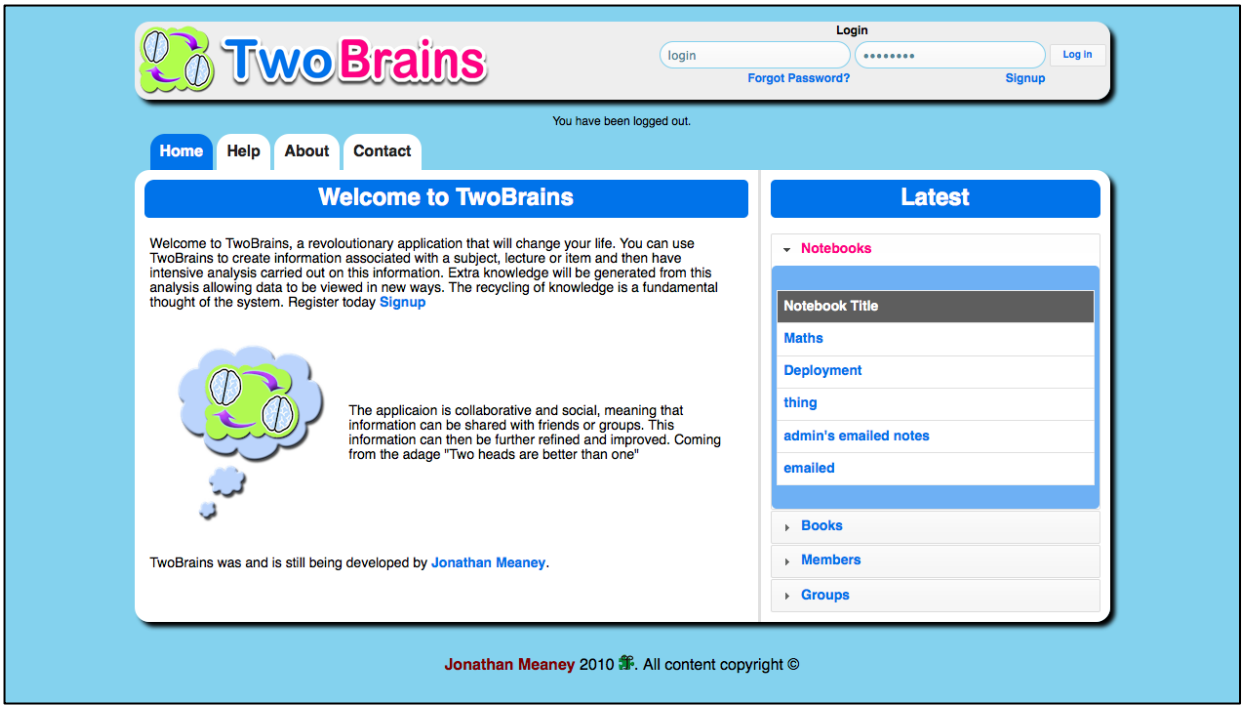

Figure 6: TwoBrains 1 final design and layout

3.9 Conclusion

This chapter focused on TwoBrains 1 and what it was before the second phase of development. The design, structure and features of the application were discussed in order to give a firm basis of understanding for how further implementation of the application was conducted.

4. Architecture and Implementation

4.1 Introduction

This chapter describes in detail the architecture and implementation of TwoBrains 2. We begin with a brief overview of what TwoBrains 2 is followed by what its requirements were and how development took place. Finally a detailed analysis of the implementation of TwoBrains is presented in defined by different prototypes.

4.2 What is TwoBrains 2?

TwoBrains 2 embodies the second phase of development of the LESN. Using the findings from the research several new features were implemented in order to further reinforce the educational experience of the learner. The previously implemented features of TwoBrains 1 were updated and brought into line with the new understandings gleaned from the intensive research which was conducted.

A new fully featured messaging section has been created in order to allow for a deeper level of communications to take place between learners. This messaging section is divided into different inboxes concerned with different types of message, whether from other learners or from the system itself informing you of certain events occurring with your content.

The ideas of sharing, liking and disliking content have been implemented throughout the application. It is now extremely easy for a learner to share their content or any public content they come across with their friends of pre defined groups of friends known as collections. They can also publicly like or dislike the content, alerting other users to the quality of the content on offer.

There are several aspects of TwoBrains 2 that are designed to promote the three C's: Creation, Contribution and Collaboration. Each of which are extremely important in creating an environment that is rich in activity and learner participation.

TwoBrains 2 also offers extra intelligent functionality to recommend suitable external readings and media to the learner upon summarizing and analyzing their content. The system will also determine what topics a learner knows and will intelligently suggest suitable friends and material to the learner.

4.3 Requirements Specification

This section details the functional and non-functional requirements of TwoBrains 2. These requirements were determined from the research that was conducted and previously discussed.

4.3.1 Functional Requirements

Requirement	Motivation and description
Event creation and updating	This functionality allows users to create an Event, specifying a time and members to be invited. This function serves as a means of encouraging participation in the application.
Mail/Messaging system	A deeper level of communication is a desirable feature as communication is one of the most important aspects of the social network. Thus functional requirement dictates that a system should be created with sufficient complexity to allow for a fully fledged messaging system to be implemented. This messaging system will allow users to easily send messages to one another. The system will also divide messages into different boxes depending on their origin. This separation of messages will clearly define the classification of the message.
Status updating (Microblogging)	A feature of most SNS's is status updating. The feature is traditional to the SNS so it needs to have an incarnation in TwoBrains as users of the SNS prefer to see features that they are familiar with.
Activity stream	The activity stream is another common

	feature of the SNS. This feature places the user at the center of the application where they are presented with a summary of what their friends activities have been. This can incite much participation and discouse. This requirement is an extremely crucial element of TwoBrains.
Like/Dislike content	The ability to publicly declare content to be good or bad is another important feature of the SNS. This requirement dictates that the user should be able to like or dislike many different types of content on TwoBrains, with this decision being publicly conveyed to other users of the application.
Online friends and online status	This requirement presents the user with a list of their online friends and some quick actions to communicate with specific online friends. The online status of the user can also be changed to a range of statuses, online, away, busy, offline.
Friend collection creation and updating	A collection of friends is a user defined group containing specific friends. This requirement dictates that collections can be created, updated and destroyed with the ability to add and remove friends from the collection at will.
Sharing content	This requirement describes the sharing aspect of TwoBrains. Functionality should be developed in order to allow users to share the

	content they are currently viewing on TwoBrains. This content can be shared with individual friends or collections of friends.
Better Tagging	Tags should become links to a central tag repository that can display any content that is tagged with the selected tag.
Chat creation and updating	This requirement dictates that chats can be created, updated or destroyed allowing a user to specify the members of the chat. The members must accept the chat invitation before they can take part in the chat. A chat is a live active discussion between several participants that can be used to share external content or generate content based upon the discussion taking place in the chat. This is an extremely important feature of the application as live discourse and collaboration are important aspects of the SNS and LESN.
Content managment	This requirement dictates that functionality should be created in order to allow the user to easily manage their content from the one section. The dashboard section should be updated with new tabs concerned with the different types of content created by the user. From these different views it should be possible for the user to directly interact with and update easily their content.
Note Versions	This requirement dictates that the notes

	functionality needs to be updated in order to include versions of notes. This functionality will allow for previous versions of notes to be stored and reverted to at will.
Web Service integration	Integration with different web services such as Delicious, Youtube and Wikipedia will be used to provide extra content to the user when analyzing and summarizing their content. This requirement is important as it provides extra information to the user concerning a certain topic.
Copy/Move notes	This functionality allows for a user to copy or move a note to a different notebook of their choice. This feature adds to the functionality of the note and notebook.
Note highlights and popular highlights	This feature allows users to select a section of a note and highlight it. Highlighting it will save it to their personal highlights for that note and add it to the popular highlights section of the view. This feature displays to users what the most popular sections of a particular note are.
Note permissions	This requirement dictates that the user should be able to add specific friends to a list of active editors that can make changes to and update a particular note.

Table 6: TwoBrains 2 Functional Requirements

4.3.2 Non-Functional Requirements

The non-functional requirements for TwoBrains 2 are the same as for TwoBrains 1 that have been previously discusses. There are however some new non-functional requirements. This new requirements are presented in table 7.

Requirement	Motivation and description
Rich and featured user help guides	The help section from TwoBrains 1 should be updated and expanded to feature the new features added to TwoBrains 2.
Privacy	Privacy is a requirement of most SNS's. Data needs to be secure and only accessable by the appropriate individuals.

Table 7: TwoBrains 2 Non-Functional Requirements

4.4 Methodology

4.4.1 Rapid Application Development

The software development methodology that was used in the development of TwoBrains 2 was the Rapid Application Development methodology. This methodology was also used in developing TwoBrains 1 as previously discussed so it was seen as a wise decision to continue using this methodology. Using rapid application development produced three distinct prototypes for TwoBrains 1, prototypes 1, 2 and 3. Prototypes 4, 5 and 6 of TwoBrains 2 are discussed briefly

in the following sections. An overview of the features implemented and which functional requirements are satisfied are also detailed.

4.4.2 TwoBrains prototype 4

Prototype 4 was the first prototype of TwoBrains 2 and deals with the events, messaging, status updates and activity stream functional requirements. This prototype introduced new updates to the user interface that improved the overall usability of TwoBrains. Events were implemented, allowing a user to create an event and invite friends to participate in this event. The integrated messaging system was partly implemented offering users different boxes for messages including: inbox, sent and trash. Status updates were also implemented in this prototype, allowing users to update their status at any time. Finally the activity stream was developed in prototype. This stream displays friends' activities and actions within TwoBrains, giving the user a concise list of information.

4.4.3 TwoBrains prototype 5

Prototype 5 deals with the liking and disliking content, online friends and online status, friend collections and sharing functional requirements. Publicly liking or disliking content conveys a strong meaning to other users of the application as they can easily distinguish good from bad content. This feature was implemented for several different types of content in order to provide adequate options for content approval. The incorporation of a users online status was also implemented in this prototype. This feature allows a user to be any of several states and appear as this state to other users. Sub dividing friends into collections was also implemented allowing for the sharing functionality to be fully realized. Sharing was incorporated during this prototype allowing users to share

the content they are viewing with individual friends or pre defined collections of friends.

4.4.4 TwoBrains prototype 6

This prototype deals with several of the functional requirements including improved tagging, chats, content management, note versions, web service integration, copy/move notes, note highlighting and note permissions. Some of the other functional requirements are also further implemented to reflect new and expanded functionality. This is the final distinct prototype of TwoBrains 2 and addresses the final functional requirements to be implemented as well as providing updated functionality for previous functional requirements.

4.5 The development environment and technologies

TwoBrains 2 was developed using the same development environment and technologies employed in TwoBrains 1. There is however some new additional technologies used in order to provide some of the new functionality.

4.5.1 Ruby on Rails Plugins

A Ruby on Rails plugin is similar to a Ruby Gem in that it is a package containing Ruby code. This can provide new features to the Ruby on Rails web application framework and aid in the development of new web application features.

4.5.1.1 Event Calendar [59]

This Ruby on Rails plugin allows for easy creation of Event functionality within an application. When the generator is executed the necessary template files are created. The produced files were modified in order to fulfill the Event functionality of TwoBrains 2 and provide a calendar upon which different Events could be easily viewed.

4.5.1.2 Acts as Tree [60]

This Ruby on Rails plugin allows for the creation of tree like structures within an application. In the case of TwoBrains 2 this plugin is used to create a folder hierarchy to house and display the different classifications of messages.

4.5.1.3 Timeline Fu [61]

This Ruby on Rails plugin allows for the creation of a timeline or activity stream within an application. When the generator is executed the necessary migration and model are created which can instantly be incorporated into the application. This plugin offers functionality to perform some action when a certain event occurs. In TwoBrains 2 this plugin is used for generating the activity stream.

4.5.1.4 Blackstar Like [62]

The Blackstar Like plugin provides functionality to allow for the recording of a like or dislike event for a specific model object by a specific user. This plugin was edited in order to provide more adequate functionality. In TwoBrains 2 the like/dislike functionality is implemented using this plugin.

4.5.1.5 Acts as Shareable [63]

This Ruby on Rails plugin allows for one model object to be shared to another model object and have association with the user sharing the object. In TwoBrains 2 this plugin is used to implement the sharing functionality.

4.5.1.6 Juggernaut [64]

The Juggernaut Ruby on Rails plugin allows the server to initiate a connection and push data to the client. It is a push server than can push JavaScript to the client in real time. This enables an application to have instant updates delivered to it by the server. In TwoBrains 2 this plugin is used to create the live chat functionality.

4.5.1.7 Wikipedia Client [65]

This plugin allows for access to Wikipedia content through the use of their API. Conducting a simple search will return a Wikipedia page in MediaWiki markup. This plugin is used to provide integration with Wikipedia and allow users to share Wikipedia URL's in the chat view the content from the chat page.

4.5.1.8 Wikicloth [66]

The Wikicloth plugin can convert MediaWiki markup into HTML. This is used in converting the returned data from the Wikipedia Client plugin into more desirable HTML to be easily viewed by the user.

4.5.2 jQuery Plugins

A jQuery plugin is a JavaScript file that extends and enhances the jQuery base code in order to provide additional new functionality. These plugins can greatly enhance the feature set of a web application.

4.5.2.1 Coda Slider [67]

This jQuery plugin provides a method of displaying content in different content panes which are animated. This display functionality is used in the updated groups section and in providing an effective interface for viewing note versions.

4.5.2.2 jQuery UI Datepicker [68]

This plugin provides an updated and more feature rich date time selector than the standard one provided by jQuery UI. This is used when selecting a date and time for when an event starts and ends.

4.5.2.3 jQuery Token Input [69]

This plugin for jQuery allows users to select multiple options from a pre defined list and uses auto complete in order to provide suitable options. This feature is used when selecting a friend to send a message to, selecting friends to invite to a chat or selecting friends to participate in an event.

4.5.2.4 jQuery Countdown [70]

This is a simple plugin that produces an active countdown timer on a page. This feature is used in conveying to the user how much time is left until an event is going to start.

4.5.2.5 jQuery Textarea Counter [71]

The textarea counter plugin is used to provide an active count of characters used in a status update. Only 280 characters are allowed for a status update and this plugin enables the user to see how much there is left in creating a status.

4.5.2.6 jQuery Isotope [72]

Isotope is an extension to jQuery which allows for the creation of intuitive interface layouts. It has many features which help create a new user interface design. Isotope contains layout modes which intelligently creates dynamic layouts that are fluid and change in real time. This plugin is used to display friend collections and tag collections in an intuitive way.

4.5.2.7 jQuery Text Highlighting [73]

This is a very simple plugin that can highlight the desired text on a page. This is used in highlighting user-defined text in a note.

4.5.2.8 jQuery Context Menu [74]

The context menu plugin is used for the note text highlighting functionality. When a user selects the text they wish to highlight they must perform a right click and select highlight from the menu that is presented to them. This will then highlight the text they have specified and save it to their list of highlights.

4.5.2.9 jQuery Quicksand Plugin [75]

The quicksand plugin provides functionality to easily sort and manipulate lists of data in an extremely animated way. This feature is used in the friends section. Options are provided to sort friends by their online status.

4.5.3 Ruby Gems

4.5.3.1 Paper Trail [76]

The Paper Trail gem allows you to track changes made to a models data. This is particularly good in keeping different versions of a model objects state. Options are provided to easily view all versions of a model object as well as revert to a specific one. This functionality is used to implement the versions feature of notes.

4.5.3.2 Authlogic [77]

The Authlogic gem is a simple and powerful authentication solution. Many features are offered including the ability to track the online presence of a user along with recording other important information concerning that users

interaction. This gem was preferred over the Restful Authentication plugin as it offered some superior features.

4.5.3.3 Differ [78]

The Differ gem is a flexible library that is excellent at producing differences between strings. It can accept and produce different formats such as HTML. This gem is used in displaying the differences between different versions of a note.

4.5.3.4 Hpricot [79]

Hpricot is a fast and flexible HTML parser. This gem is used in the chat section of TwoBrains 2. When a user shares a YouTube link with the members of the chat Hpricot is used to strip the ID of the YouTube video from the link so a fully formed video object can be displayed to the users.

4.5.3.5 Httparty [80]

The Httparty gem provides functionality to perform easy get or post requests to a web page or web service. It is used in the chat section to obtain the HTML of a web page a user has shared with the other members of the chat. This HTML is then viewable by the members of the chat from the chat.

4.5.3.6 Sanitize [81]

Sanitize is a powerful HTML sanitizer. It is highly configurable by defining lists of acceptable elements and attributes and will remove all unacceptable elements. It

will always output valid HTML. This gem is used to sanitize the HTML produced by the Wikicloth plugin and the Httparty gem.

4.6 Prototype 4

This is the first prototype of TwoBrains 2 and deals with some of the important features deemed necessary for implementation from the research that was conducted into SNS and LESN ideology and design.

4.6.1 User Interface Refresh

Initially it was deemed necessary to update the user interface in order to provide means for new functionality to be navigable. The update consisted of overhauling the main navigation of the application located at the top of the screen. The old button system was removed and more streamlined navigation option was implemented. This navigation pane remains in the same position when the user scrolls down the page. This allows for quick navigation to take place without the need to scroll back to the top of the page to change sections. A new bar called the secondary section bar was also created beside the live search bar in order to house new functionality to be implemented in this and future prototypes. Finally, located at the bottom of the page is another bar that continually follows the users progress on the page. This bar will be used to display online friends and notifications. Some other less significant interface updates include changing the size and color of the shadow produced by the elements on the page and changing the color of the sub navigation tabs to be gray. Other updates to the interface not present here will be discussed in the coming prototypes. These changes produced a more refined feel to the application. Figure 7 displays the refreshed interface.

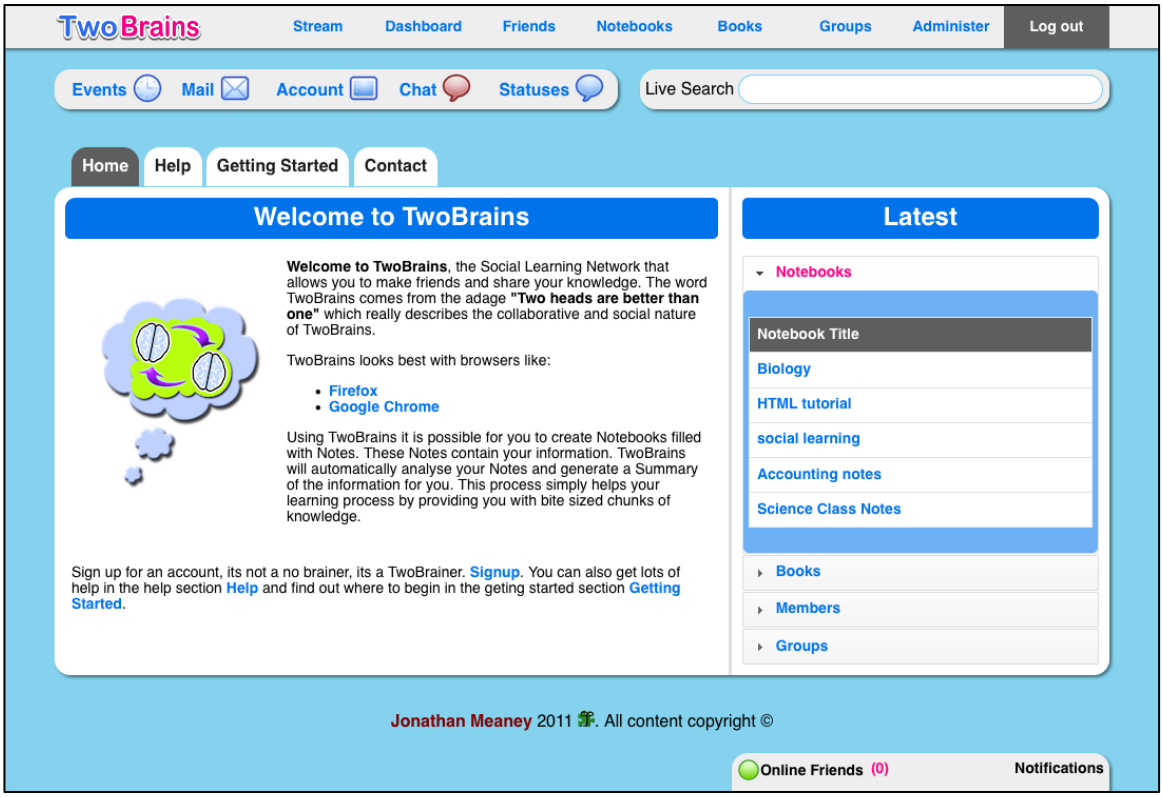

Figure 7: Refreshed TwoBrains User Interface

4.6.2 Events

The implementation of the events functionality was seen as a good aid to a users educational experience by allowing them to actively create an event based around a specific topic and invite friends to participate in this event. The events calendar plugin was used to create the basic template for events. Further development occurred in order to produce the functionality of the events section.

The events controller with typical create, update and destroy functionality was created along with corresponding views. Two models were created, the event model and the event_member model. The event model was updated to include

new fields not present in the event calendar plugin. These fields were title and description. All fields are required to have a value when creating a new event.

The event member model is concerned with the members of an event. Event members can be of different states such as requested or accepted. A user must accept an event request in order for them to become an accepted member of the event.

The events section is divided into different tabs: events, new, calendar, accepted and invitations and can be accessed by selecting events from the secondary section bar.

4.6.2.1 My Events

The events tab displays all the users created events. The events table is paginated and sortable and provides the same extra functionality that TwoBrains 1 tables provided. When a user hovers over a row a set of extra actions becomes available allowing the user to view, edit, delete or see extra information about the selected event. Figure 8 displays this view along with the extra information concerning one of the events.

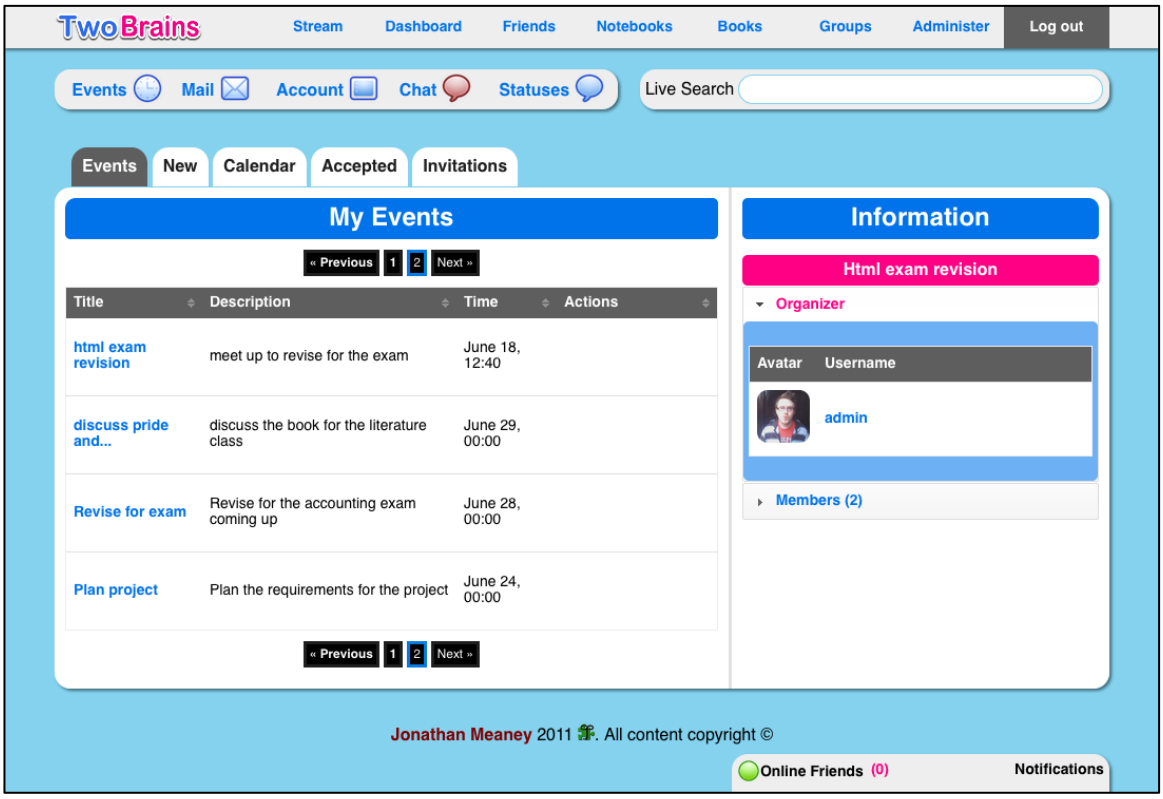

Figure 8: My events view

4.6.2.2 Creating new events

Creating an event is a simple task. This can be accomplished by selecting the new tab from the sub navigation area. When the user selects this menu option they are presented with the view illustrated in figure 9.

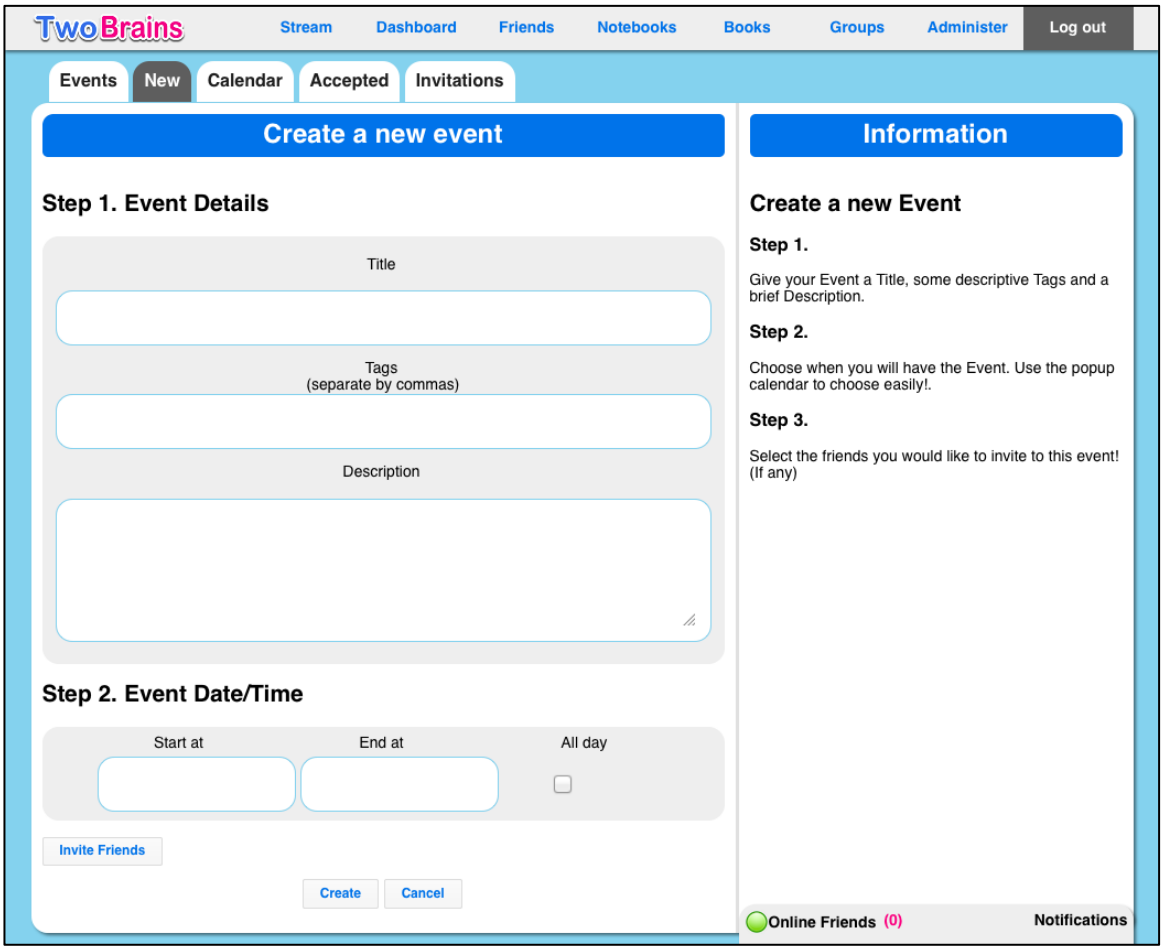

Figure 9: Creating a new event

This view best illustrates the newly refreshed interface for the creation of content in TwoBrains 2. The creation process is divided into a series of steps each with an explanation as to what that particular step is accomplishing. This new design is incorporated in all other content creation pages in TwoBrains 2. The event date/time selection is unique to the events creation view. Figure 10 displays how the jQuery UI Datepicker plugin was used in order to create a better date/time selection process.

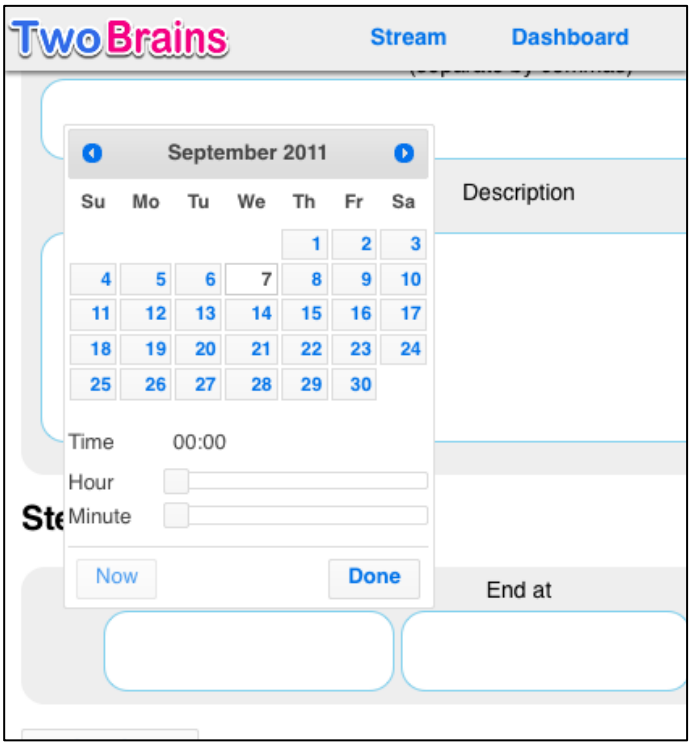

Figure 10: Selecting a date and time

Another feature of creating an event is the ability to invite friends to participate. This functionality is implemented using the jQuery token input plugin. A controller was also created called tokens whose index action returns a JSON object containing a list of friends. The token input plugin takes the user input and access the token controller index action. The action will then search for a friend with the same name or login as the input string. If a result is found it is returned to the plugin via JSON. This is then displayed to the user as a list of options to choose from. This functionality is displayed in figure 11.

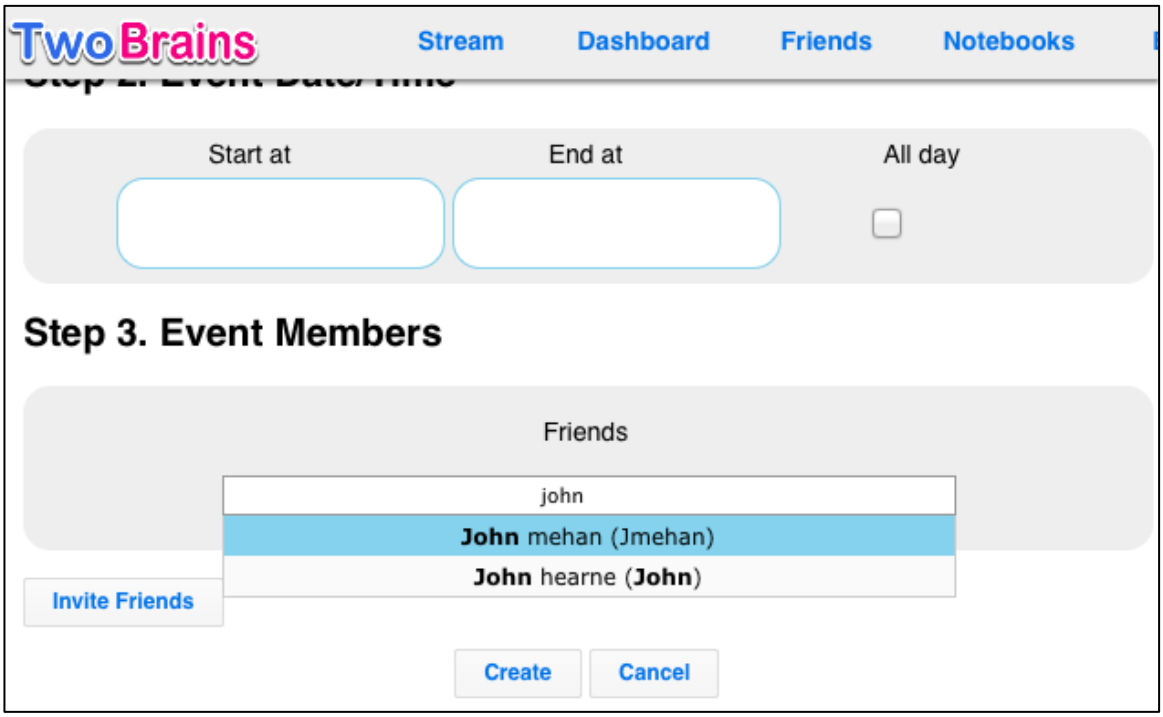

Figure 11: Using the token input plugin

Upon creating a new event the user is then presented with the event they have just created. This event show view is illustrated in figure 12.

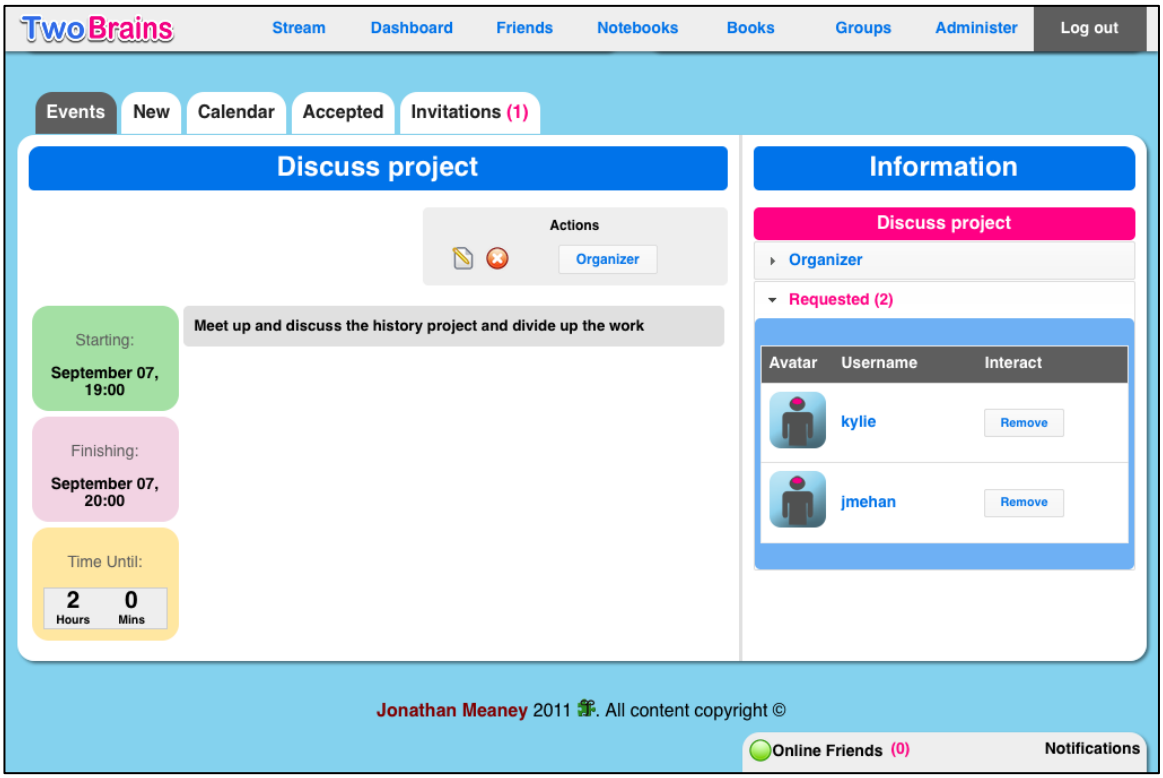

Figure 12: Showing an event

The show page displays the details concerning the event such as the organizer, the requested members and the accepted members. The event times are also displayed in a traffic light formation. The green section indicates the start time, the red section indicates the end time and the orange section displays the time until the event starts. This timer is implanted using the jQuery countdown timer plugin. An actions section is also provided on the show view that provides options to the creator of the event to edit or delete the event. This section will also display options to accept or decline an event invitation if the option is necessary.

4.6.2.3 Calendar

Another feature of the events calendar plugin is the calendar itself. Methods are provided that allow for the creation of and display of a detailed calendar that

displays events. This feature allows the user to easily plan their events by viewing them in a stylized and simple way. Figure 13 displays the calendar view with some events.

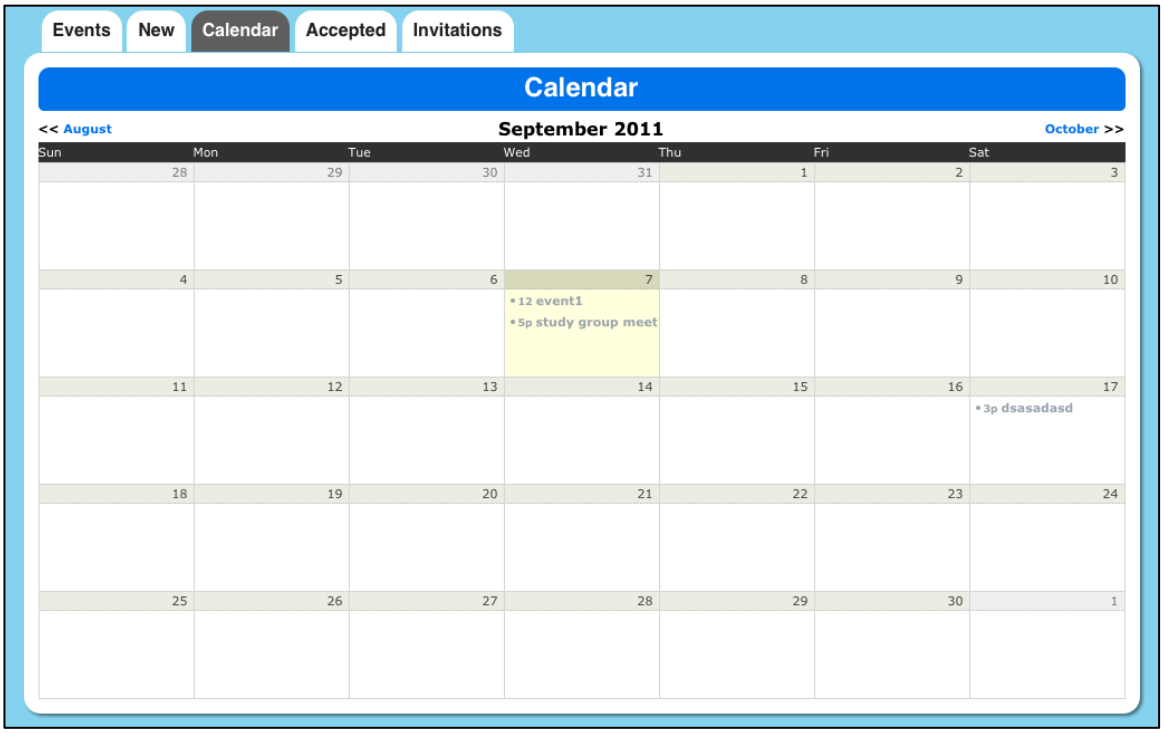

Figure 13: Events calendar

4.6.2.4 Accepted events and invitations

The accepted events tab presents the user with a list of events they have accepted participation in. The view provides the same functionality previously described for listing events. The invitations tab contains a list of events that the user has been invited to participate in. This list contains some new features in order to allow a user to accept of decline the invitation. The accept and decline functionality is also available in the event show view as previously discussed. Figure 14 displays the event invitations view.

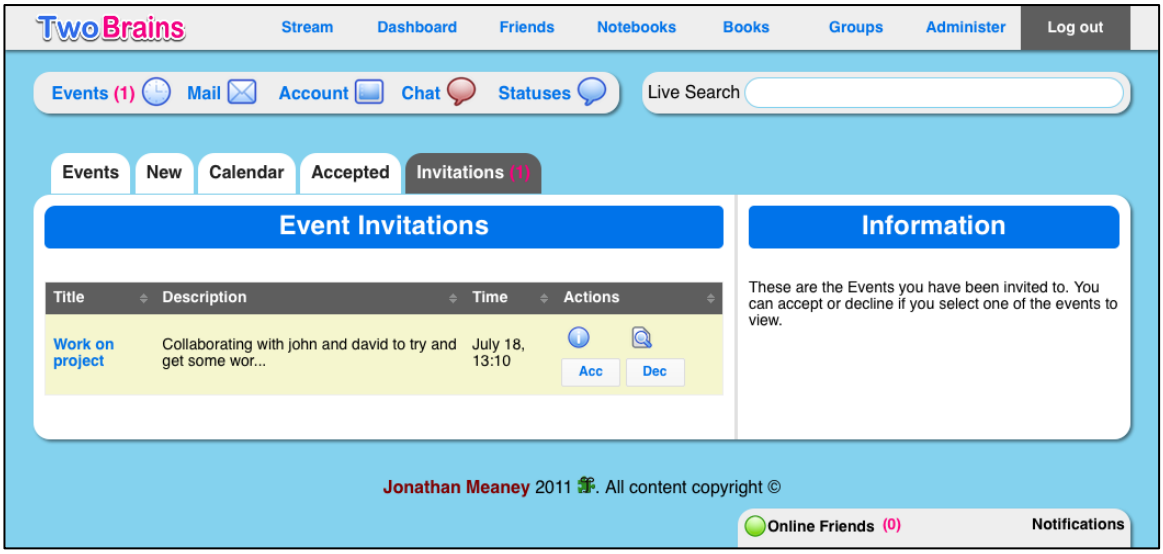

Figure 14: Event invitations

This view also shows another addition to the refreshed user interface. We can see after events and invitations a “(1)”. This signifies to the user there is a new item that requires their attention. The feature is implemented in various sections of TwoBrains 2 in order to alert the user to new content.

4.6.3 Mail

Implementing a fully featured and integrated mail system inside TwoBrains was deemed a necessity as it allows for an unprecedented level of direct communications to take place between users. It is also seen as a common feature of the SNS and LESN. To access mail a user needs to select the mail option from the secondary section bar.

To implement the mail functionality three controllers were created, the mailbox, messages and sent controllers. The mailbox controller provides actions for

displaying each of the different types of box provided and the messages they contain. The messages controller contains several actions such as show, destroy or reply to a message. The sent controller handles the mail composition and sending actions.

Three models were also created, the message, message_copy and folder models. The message model contains the information of the message including a subject, body and author. The message copy model contains information about the message such as recipient, what folder it is in, whether the message has been read or not and whether the message is deleted or not. The folder model uses the Acts As Tree Ruby on Rails plugin in order to function as a hierarchical structure for storing different types of mail. Folders have names, belong to a user and store messages inside them. Each user has folders automatically generated for them and their mail requirements.

4.6.3.1 Boxes

The mail section is divided into different boxes with different types of message being available in each. Boxes are different folders. The three types of box are: inbox, sent and trash. These can be accessed from their respective tabs. The inbox contains mail that has been sent to you. Sent contains mail you have sent to others and trash contains the mails that you have deleted. If you wish to undelete a mail it is possible to restore it to its undeleted state. Figure 15 illustrates the inbox with a new mail.

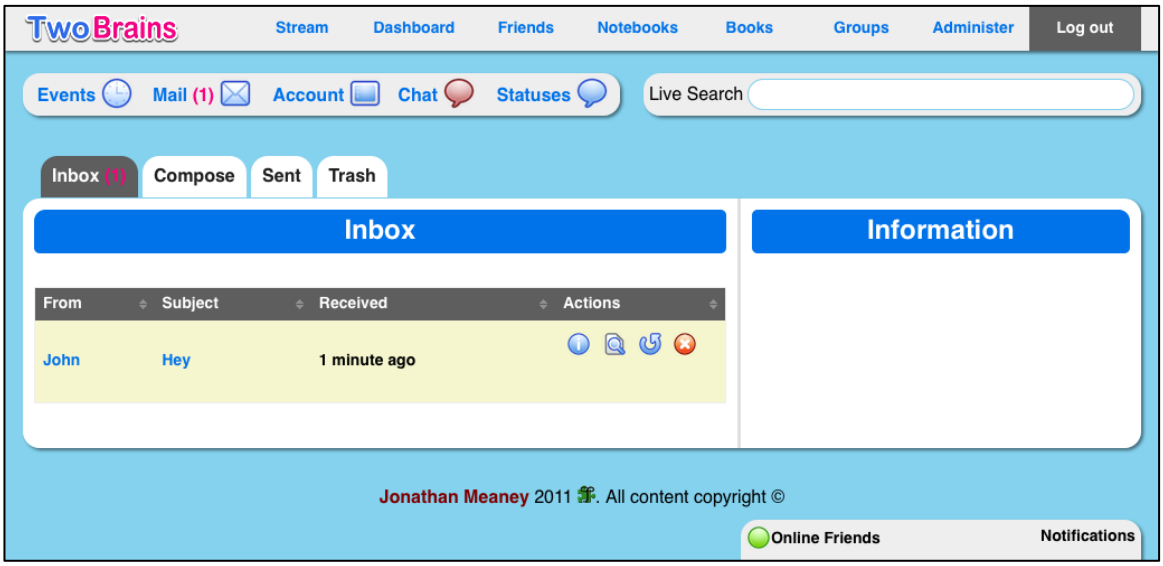

Figure 15: Mail inbox view

We can see from the figure above that the actions box provides the same features previously described. There is however a new option available in the mails actions box. Reply is available here to enable quick reply to a mail. The new content indicators after mail and inbox are also present signifying to the user they have a new mail. The sent and trash views provide similar features and layout displayed in figure 15.

4.6.3.2 Composing a Mail

The new mail view can be reached by selecting the compose tab. The view presented incorporates several previously discussed design elements such as using the token input plugin to select a recipient. Composing the body of the mail is accomplished by using the tiny MCE editor that was used in TwoBrains 1 to provide the note creation functionality. Figure 16 displays the editor as it is used for composing the body of a mail.

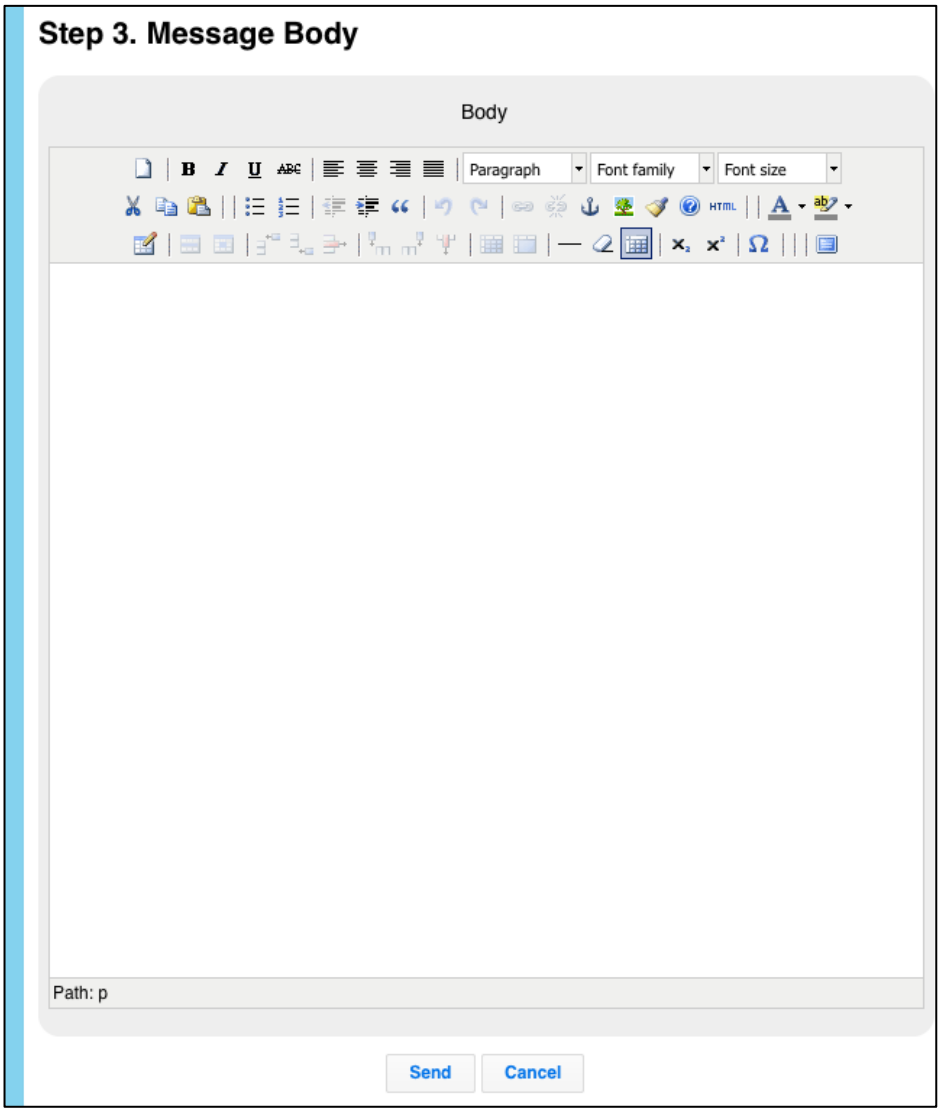

Figure 16: Mail body editor

4.6.4 Status Updates

Status updates and micro blogging are popular with most SNS's. The status update feature was seen as a necessary feature to implement in TwoBrains 2 as it provides some familiar functionality to users who frequent other SNS's.

In order to implement the status update functionality a statuses controller and model was created. This controller contained the typical actions you would expect to create, update or destroy a status update. A status model was also created. A status model object belongs to the user and requires the body of the status to be not null.

4.6.4.1 Creating and viewing status updates

A view was created to display the status updates of the user and their friends. To access this view the user needs to select statuses from the secondary section bar. This view also contains an input box to create a new status. This input box uses the jQuery Textarea Counter plugin in order to limit the users input to 280 characters. This plugin displays how many of the 280 characters limit remains. When a user creates a new status update the new status will appear at the top of the list without the need of a page refresh. Figure 17 displays the status view.

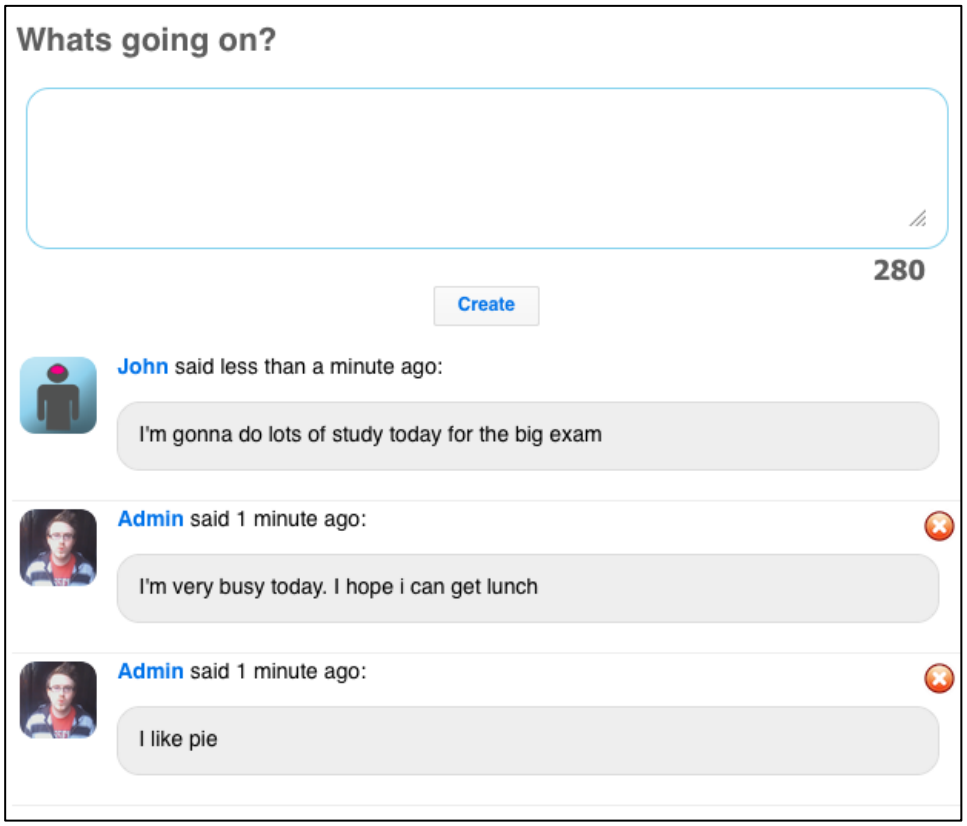

Figure 17: Statuses view

A secondary method of creating status updates was also implemented. If the user selects the blue speech bubble from the secondary content bar a box will slide down containing a status update form. From here the users can update their status easily. This feature is available from every view in TwoBrains 2. Figure 18 displays the secondary status update feature.

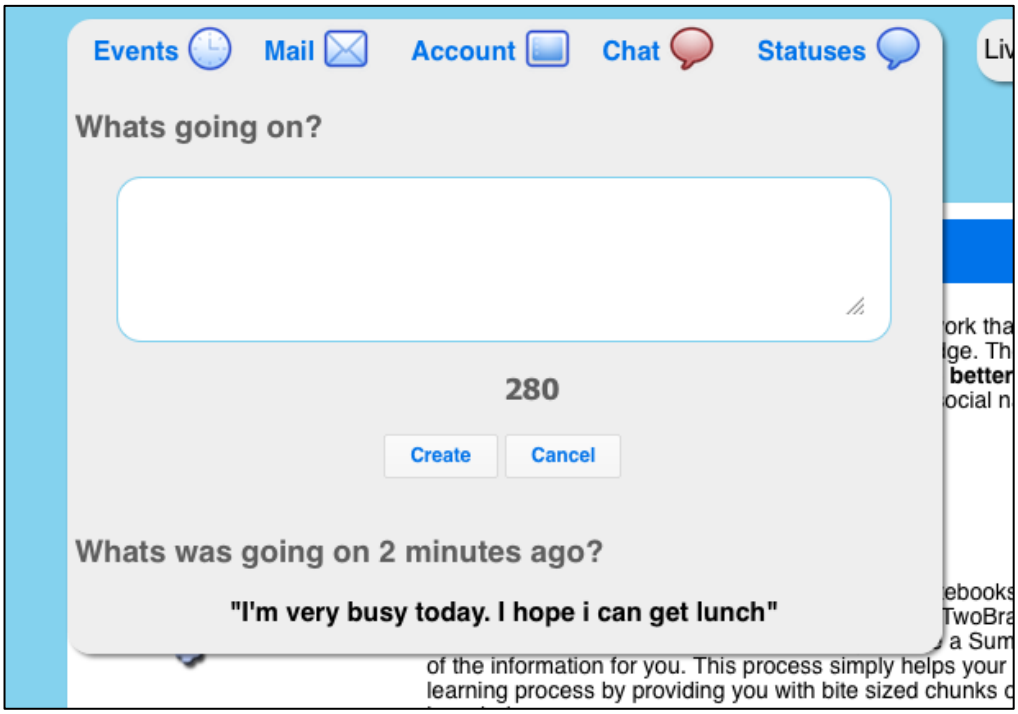

Figure 18: Secondary status update feature

4.6.5 Activity Stream

Another prominent feature of the SNS is the activity stream. An activity stream is list of information that is generated from the interactions of users with the system. This list contains information such as status updates, comments and new friends. It serves as a historical timeline for events and interactions. The activity stream is an extremely important feature of TwoBrains 2. It enhances and inspires communications between users and furthers participation in the application.

To implement the activity stream a ruby on rails plugin was used. The Timeline Fu plugin allows for easy generation of database migrations and models to facilitate the recording of timeline events. It also provides enhancements for models to create a new timeline event when a certain event on the model occurs.

The generated timeline_event model records the event type, the user and the subject of the event.

4.6.5.1 The stream

In order to house the activity stream the stream section was created and is accessible by selecting stream from the main navigation area. The stream is also displayed when a user first logs in, giving them quick access to their friends activities.

The stream section is divided into different streams, the activity stream and the status stream. The stream is concerned with the constant flow of information to the user therefore combining the activity stream and statuses were seen as an excellent decision.

The activity stream displays all the recent activities of the users friends. To implement the activity stream view a helper method was created to determine the type of timeline event to be displayed. This helper would then display the correct layout for that event. Views were created for each of the current types of event. Figure 19 illustrates the activity stream with some different timeline events.

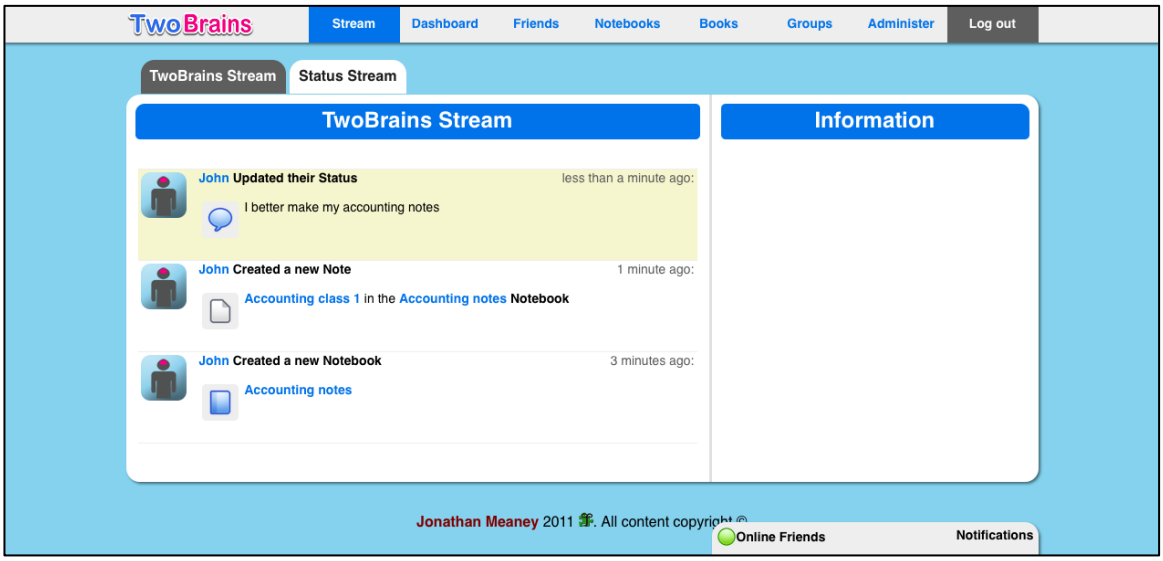

Figure 19: Activity stream

4.7 Prototype 5

4.7.1 Liking and Disliking

The ability to publicly like or dislike content allows users to effectively communicate their feelings to other users. This functionality was deemed a necessary addition to TwoBrains 2 in order to give the learner a gauge for the quality of certain content.

The Blackstar Like plugin handles the liking and disliking of a model object by a user. It generates a database migration and provides many options for use. The functionality was updated to include new methods for finding the likes and dislikes of a certain user. The Timeline Fu plugin was also integrated so that like and dislike events were recorded as timeline events, the corresponding event views were also created. A like controller was also created in order to house the like and dislike actions.

4.7.1.1 Implementing like and dislike

To incorporate the like and dislike functionality across different sections a set of partial views was created that could be easily used anywhere. These views contained buttons for like, dislike and a graph button. When selected the graph button will reveal a simple graph displaying the current likes and dislikes for the currently viewed content. The like and dislike functionality will update the page automatically when selected, there is no need for a page refresh. Figure 20 displays the like and dislike feature.

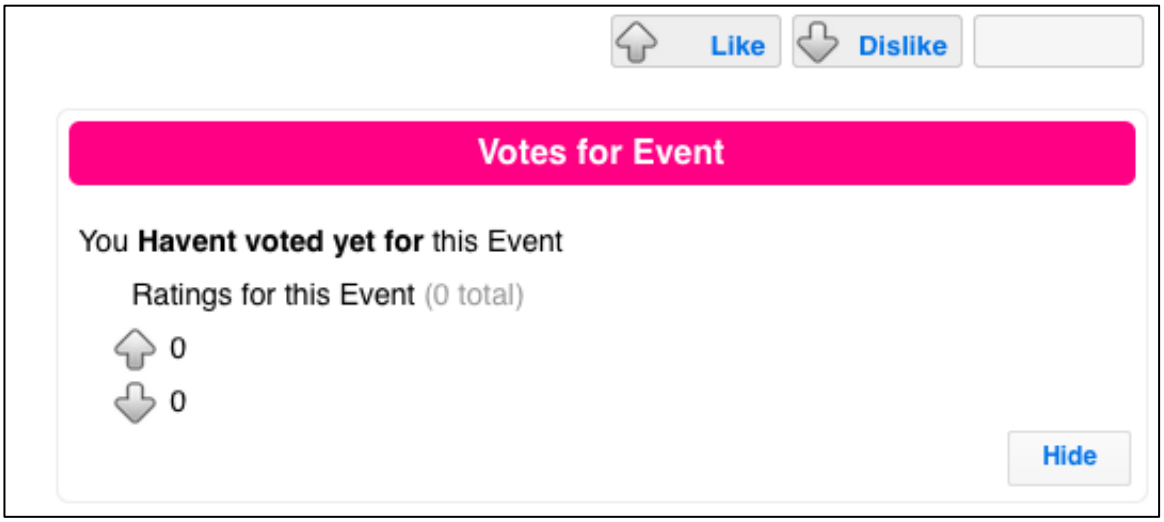

Figure 20: Like and Dislike feature

4.7.2 Authlogic

The Authlogic gem provides many more powerful and desirable features than the Restful Authentication plugin used in TwoBrains 1. In order to implement the online friends feature of TwoBrains 2 it was necessary to migrate from using

Restful Authentication to Authlogic. Fortunately Authlogic have provided functionality in their gem to easily migrate from Restful Authentication. Only a few modifications to the user model and database table were required. When the migration had been successfully completed the next stage of development could begin.

4.7.2.1 Online Friends and Online Status

Authlogic provides a method for determining online users. A method was created to scan a users friends and determine which ones were online. The ones that are online are then returned. This functionality is implemented in the bar located at the bottom of the screen. This bar, when clicked, will reveal a list of friends that are currently online.

A users online status is an important aspect to convey to other users. An online status can be one of four different states: online, away, busy or offline. To implement this feature an online status model was created. This model records the current online status of the user. Functionality was created in the bottom bar along with online friends to allow a user to change their online status. By clicking on one of the colored circles a user can instantly change their online status. The online friends and online status is shows in figure 21.

Figure 21: Online friends and online status

4.7.3 Friend Collections

The friends section of TwoBrains 1 required some updated features. The newly implemented user online status should be reflected in the friends section as well. It was also deemed necessary to allow for the creation of sub categories of friends called collections. A collection of friends is a user-defined group of friends.

To implement the collections functionality the collections controller was created. This controller contained typical create, update and destroy actions. This controller is also concerned with the management of collection members. Two models were also created, the collection and collection_member models. A collection model object contains the title and description of the collection. The collection member model keeps record of the friends assigned to a collection.

4.7.3.1 Updating friends section

The friends section was updated by displaying each friends online status next to their entry. Functionality was created using the jQuery Quicksand plugin to allow a user to sort their friends by their online status. A simple selection menu was created displaying the different online status options to sort by. Figure 22 displays the updated friends section.

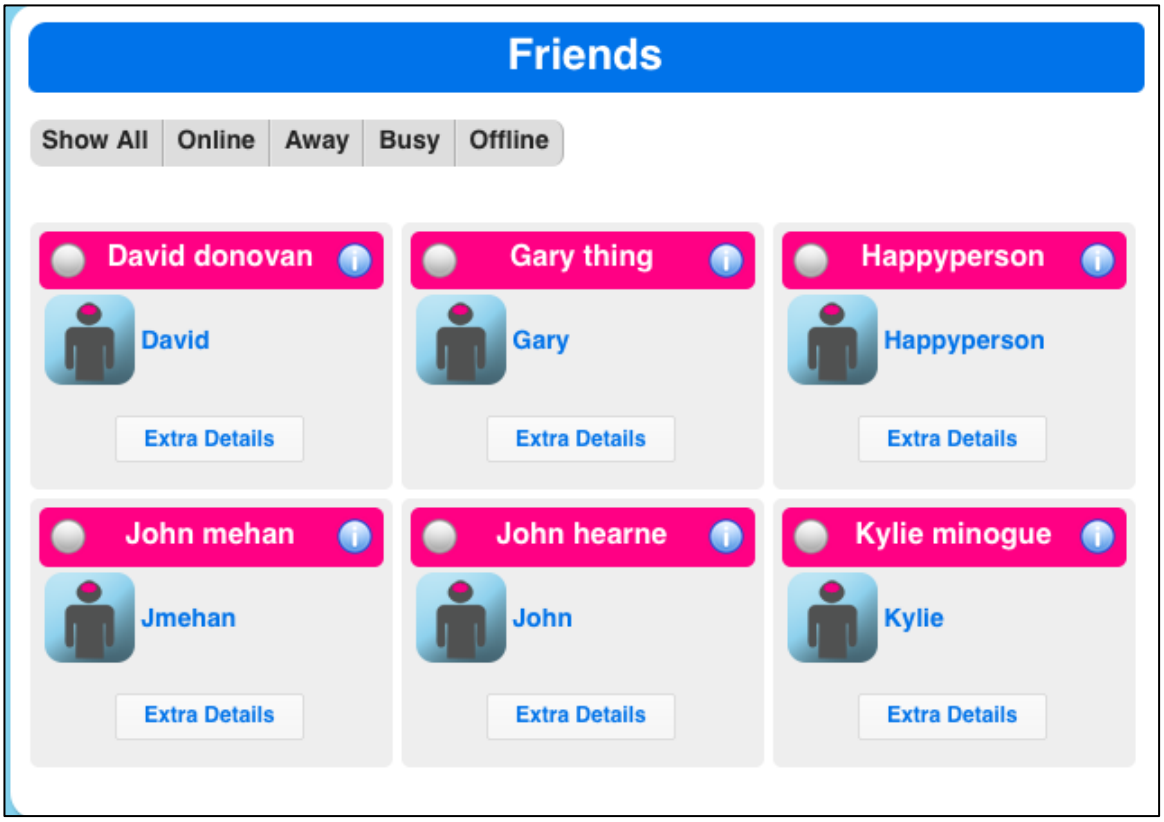

Figure 22: Updated friends section

4.7.3.2 Implementing friend collections

The friend collections functionality is implemented in the friends section of TwoBrains 2. From the secondary content section it is possible to create, update

and delete friend collections. Figures 23 and 24 illustrate the collections display and creation functionality.

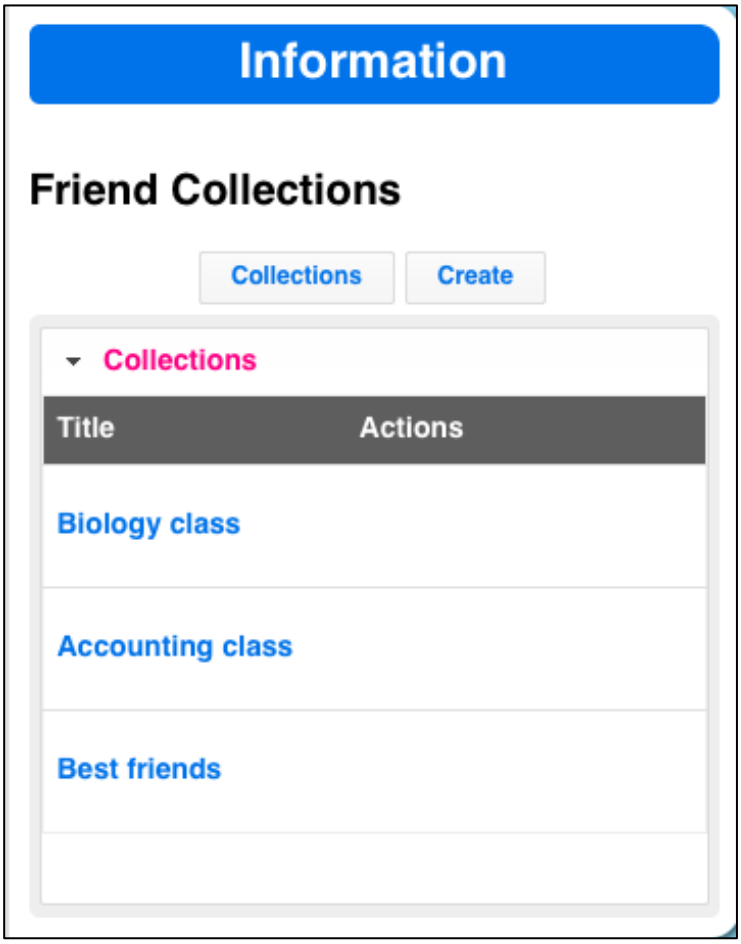

Figure 23: Displaying created friend collections

The list of friend collections is not displayed to the user until they press the collections button. The list of collections also have actions associated with them that become apparent when a collection is hovered over. These actions let the user edit or delete the collection as well as add or remove friends from it.

Figure 24: Collection creation

The collection creation form is presented to the user when they press the create button visible in figure 23. This allows a user to create a collection and add it to the list of collections without the need for the page to refresh. This focuses the user on the task at hand.

To implement the functionality of friend addition to collections so new features needed to be added to the friends section. Using jQuery the list of friends present on the page became a list of draggable items. When the user selects the option to add friends to a collection a new pane is revealed. This pane is a droppable area that can accept friends that are not already in the collection. Friends that are

already part of the collection can also be removed easily using this pane. Figure 25 illustrates the process of adding a friend to a selected collection.

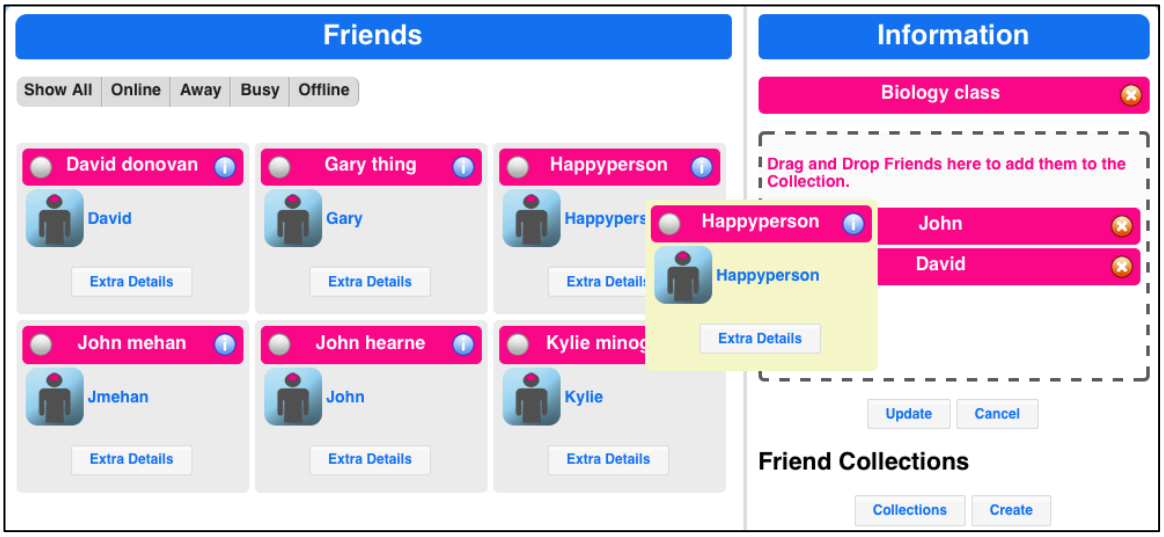

Figure 25: Adding friends to a collection

4.7.4 Sharing

Sharing is an excellent communal device that can incite discourse and participation in an SNS. This feature is an important aspect of TwoBrains 2.

The Acts as Shareable plugin was used in creating the basis for sharing. This plugin generates a database migration and provides many methods for sharing functionality. A share model object records the model object being shared and the model object it is shared with. In the case of TwoBrains 2 sharing occurs with collections or users.

A shares controller was created in order to facilitate the creation of a share. Actions were implemented allowing users to share the content they were viewing (i.e. an important notebook) with collections of friends or individual friends.

4.7.4.1 Implementing sharing

To add the sharing functionality to the appropriate views an extra button was added to the like and dislike functionality. This button, called share, displays a list of collections and friends when clicked. It is possible to select multiple collections or friends to share the content with. Figure 26 displays the sharing functionality.

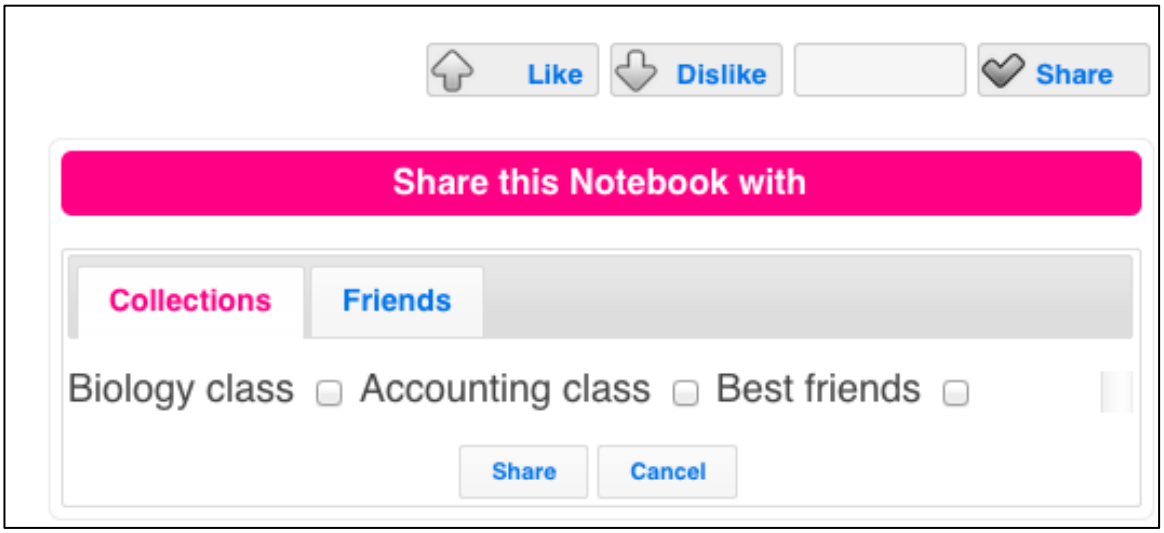

Figure 26: Sharing content

4.8 Prototype 6

4.8.1 Expanding the mail system

Due to the array of new features that were implemented it was deemed necessary to update the mail system to reflect some of the new functionality. Extra boxes were added in order to provide new mail types. The system box and share box were implemented to fulfill this need for new mail types.

4.8.1.1 Implementing new boxes

To implement the new boxes in the mail system two new folders were created for users. These folders are called system and share and function as the boxes for the new mail types. The system box is used for mail that concerns a users content. For example when a new comment is created on one of the users notes they will receive a mail in the system box detailing this new comment. The share box is used to store shared items with the user in the form of mail. The share mail will contain information detailing the content that has been shared.

In order to fully implement this new box functionality two helper methods were created to send share mail and send system mail. These helpers use pre defined mail templates that were created to facilitate the wide variety of events possible in TwoBrains 2. The appropriate actions across appropriate controllers were updated with these new helpers to facilitate the sending of new mail when specific events occur. Figure 27 displays the new system box with a new system mail. Figure 28 displays the contents of the system mail. Figure 29 displays the share box with a new share. Figure 30 displays the contents of the share mail.

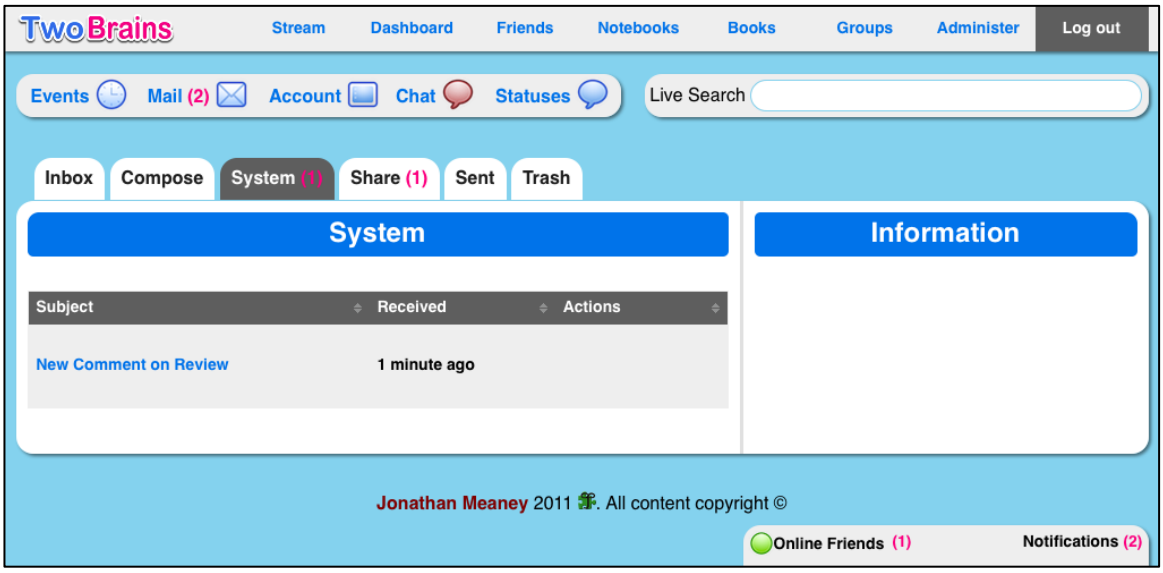

Figure 27: System box

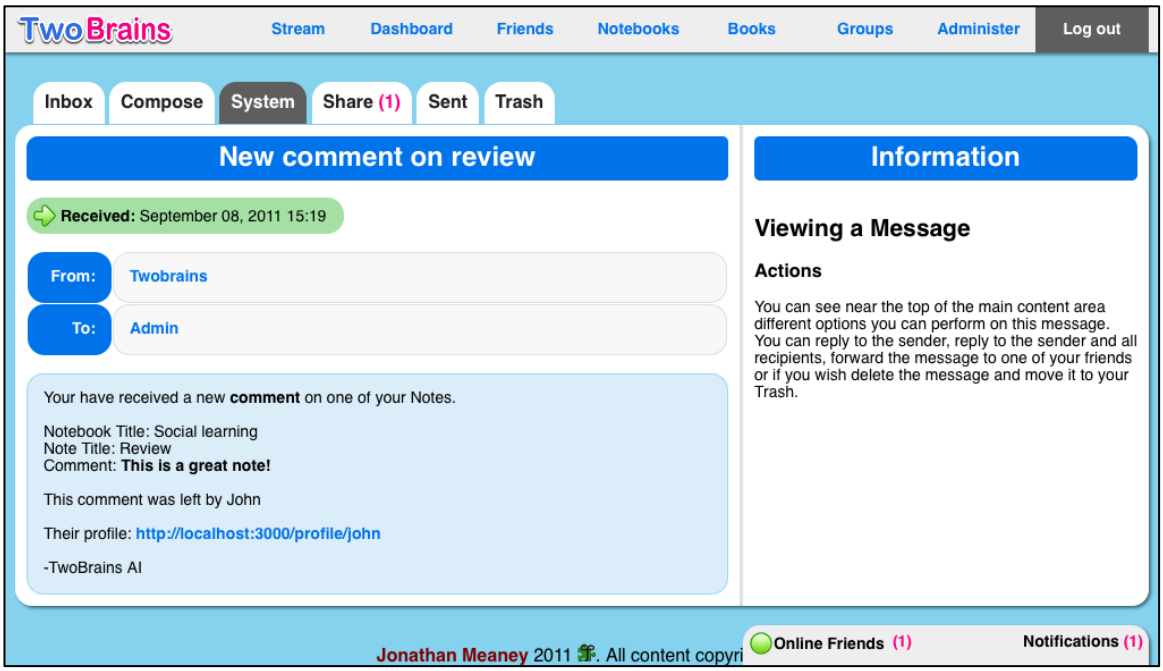

Figure 28: System mail contents

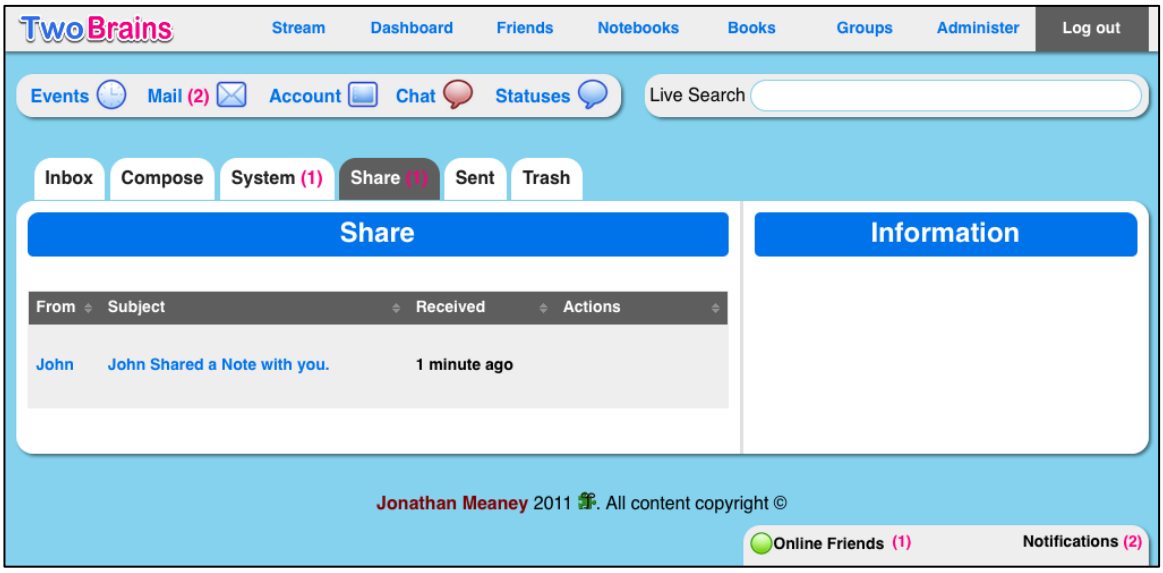

Figure 29: Share box

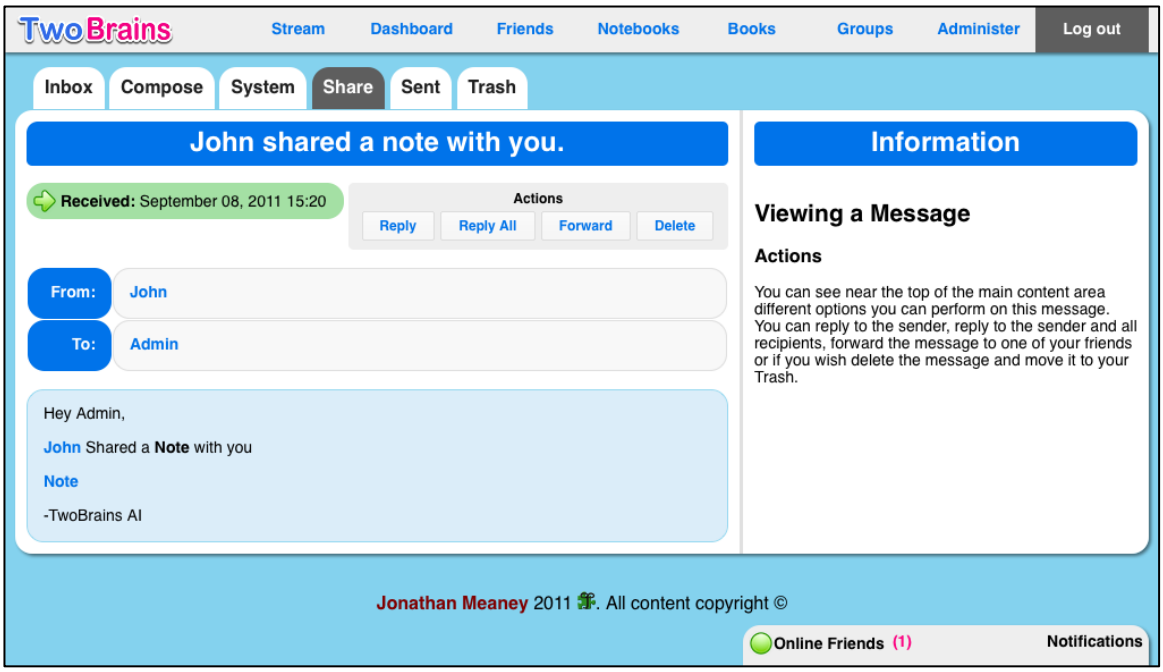

Figure 30: Share mail contents

When the final two boxes had been fully implemented the notification area was updated with new functionality. Notifications are new mail from any of the users

boxes and they can be access easily from bottom bar. Figure 31 illustrates the notification section that becomes visible when the notifications are clicked.

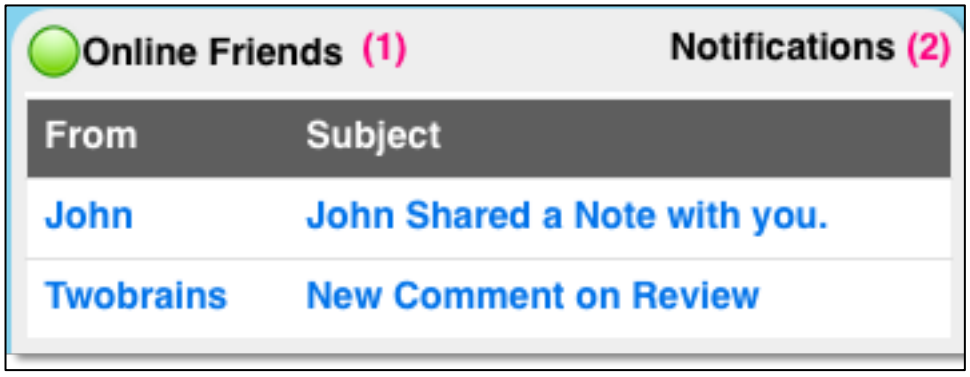

Figure 31: Notification area

4.8.2 Updating note functionality

Several new practical and useful features were chosen to be added to the notes functionality of TwoBrains 2. These features were seen to be most vital in providing a rich user and educational experience.

4.8.2.1 Note versions

Keeping record of changes to a note allows a user to revert to a previous version with ease. To create the versions functionality the Paper Trail ruby gem was used. This gem provides functionality to record changes to a models data. Using Paper Trail a database migration was created to record model changes. The note model was then updated to utilize the features of Paper Trail and record different versions of a note.

A new action and view were created for the notes controller to view a notes versions. To access this view a user would need to select a note to view. The option to view versions is then presented to the user as a tab. The versions view uses the jQuery Coda Slider plugin in order to display the different versions along with a visual guide to which version the user is currently viewing. The Differ gem was also used on this view to determine the differences in text between the viewed version and the currently used version. These differences are displayed as red text to show this text was not present and green text to show that this text was added. Typical actions are provided to the user on this view such as create, edit and destroy options. There is also an option to make a specific version the current one, allowing for the user to easily revert to a previous state when necessary. Figure 32 displays the note versions view.

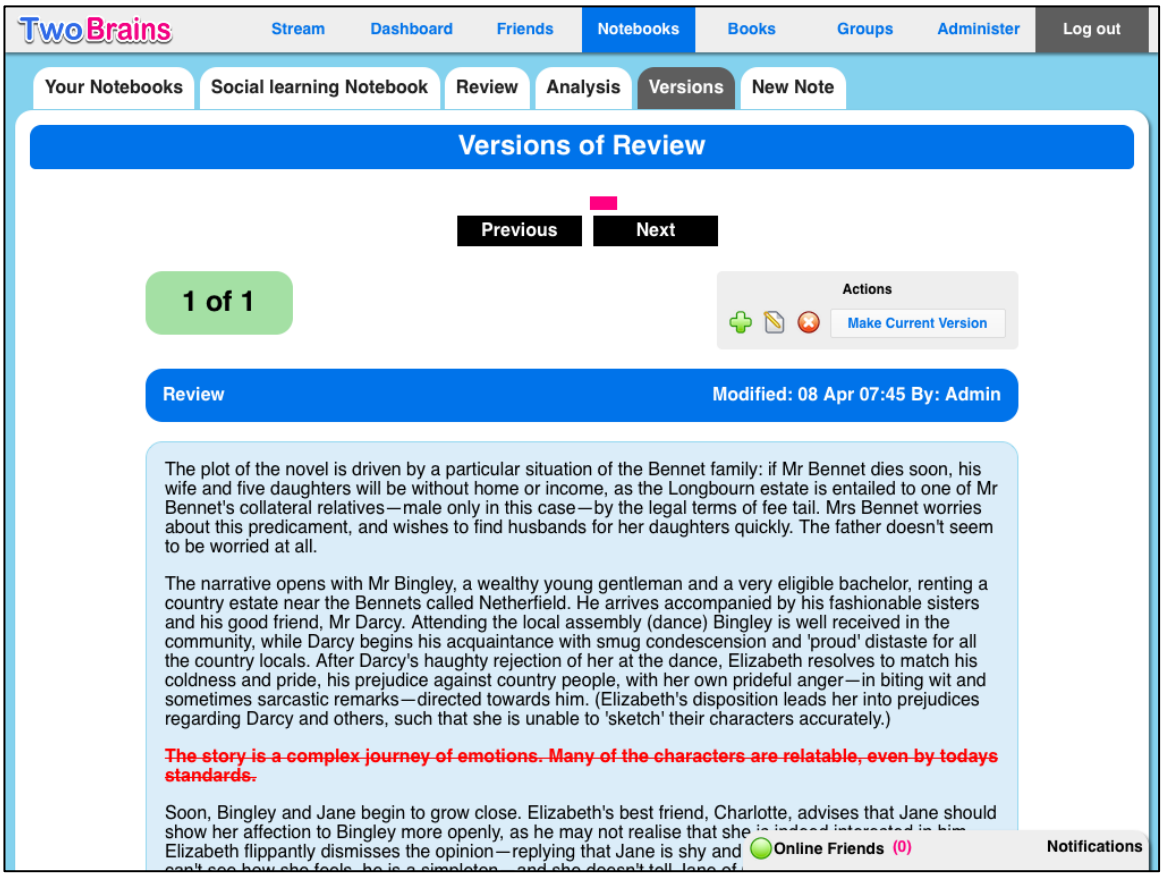

Figure 32: Note versions

4.8.2.2 Copy/Move notes

The copy and move feature allows a user to easily copy or move their notes between notebooks. This feature gives the user more flexibility with their notes and allows them to determine best which notebook a note belongs to.

New actions were added to the notes controller to facilitate the copying and moving of notes between notebooks. New options were added to the notebook and note show views to perform the copy and move functionality. When the user clicks the copy or move icon they are presented with a new interface which allows for notes to be copied or moved to another of the users notebooks. This functionality requires the user to physically drag the note they wish to copy or move to the notebook they wish to copy or move the note to. The interface will alert the user to a successful or failed copy/move. A fail may occur if a note with the same name is present in the notebook that the user is copying or moving to. Figure 33 illustrates the copy and move note functionality.

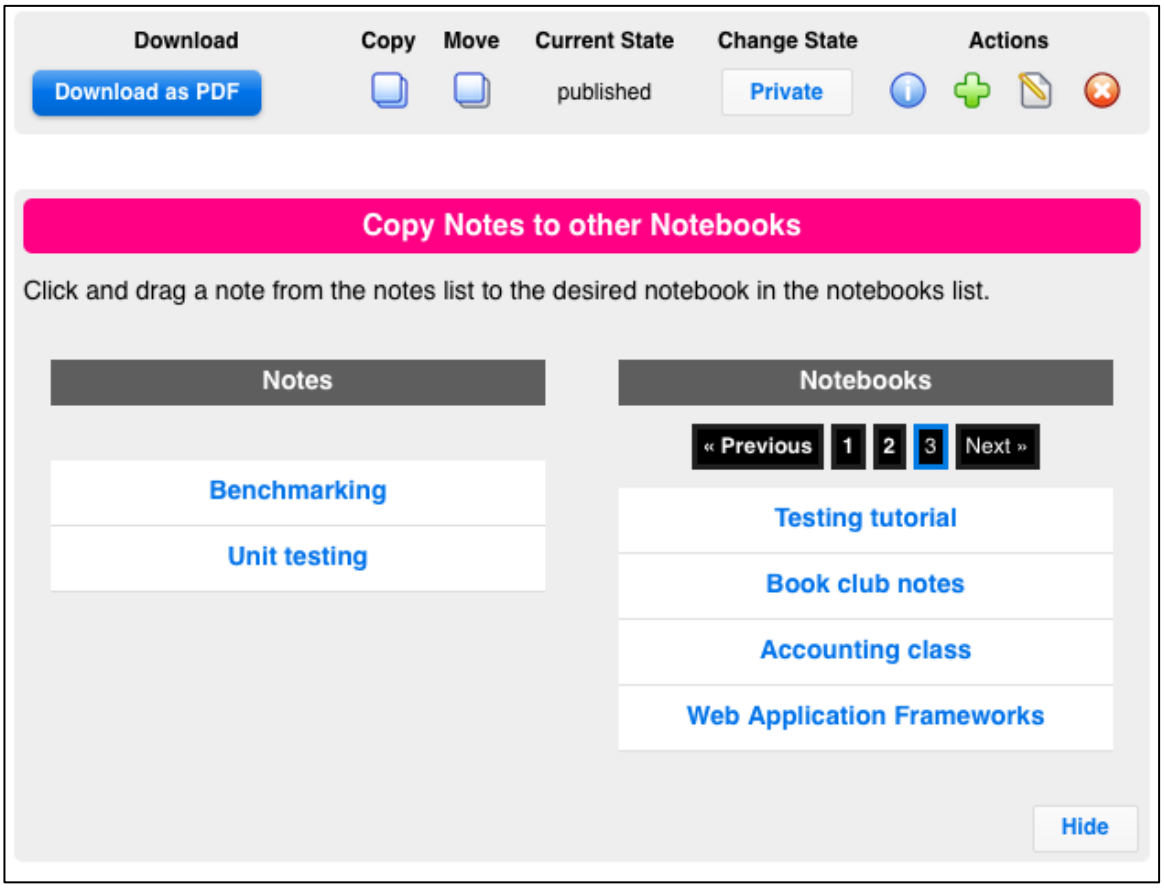

Figure 33: Copy and move notes

4.8.2.3 Redesign of note analysis

The note analysis view was updated to improve its effectiveness as a resource. The interface was tweaked and new features were incorporated to add an extra dimension of information to a note.

On the view itself the summary information section was moved to the secondary content pane where it was improved with extra analysis information. An extra content area was created with sections for external websites and YouTube videos relating to the note.

To generate the extra information two helper methods were created called get_delicious_feed and get_youtube_feed. These helpers will access the REST API's of Delicious and YouTube using the best keywords produced by summarizing a note. a. The Using the net/http ruby class it is possible to retrieve data from a web service. The API's are accessed using the net/http ruby class, this makes it possible to retrieve data from a web service. The data that is returned from the web services is JSON and is parsed by ruby to make it more easily usable. The analyses model was updated with new fields to hold the data returned from the new helper methods. Figure 34 displays the newly updated analysis view along with some extra information generated by the application.

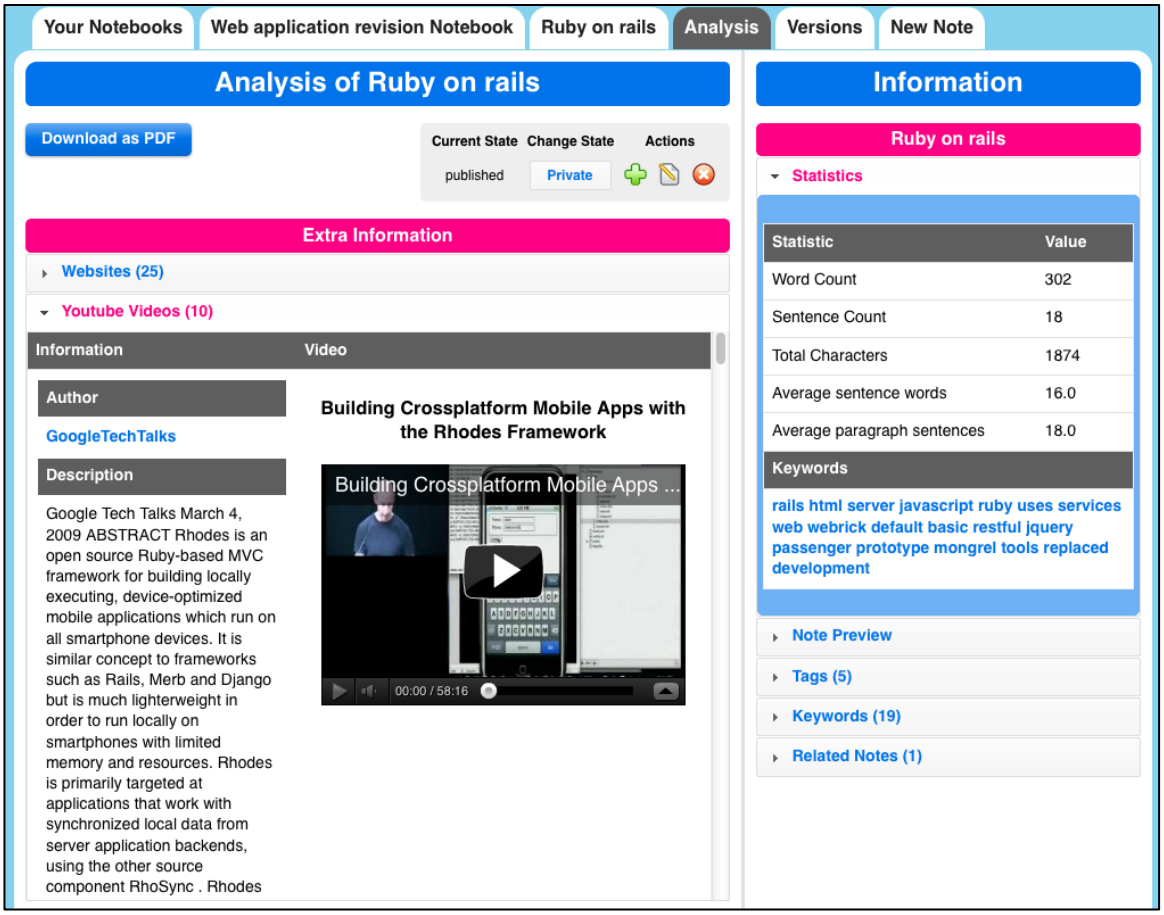

Figure 34: Updated note analysis

4.8.2.4 Note highlights

Highlighting a section of a note allows a user to save what they feel is an important section of a particular note. Other users selections are also taken into account creating a list of popular highlights indicating to all what the best sections of a note are.

To implement this functionality a highlights controller and a highlight model were created. The appropriate actions were added to the highlights controller to provide the note creation functionality. The model records the user, note and highlighted text.

The jQuery Context Menu plugin was used to create a context menu when the user right clicked the text. This menu displays an option to highlight. jQuery JavaScript functions were created to collect the text that a user had highlighted. When the user selects the highlight option from the context menu the function to get the highlighted text is called. Another function is then called which performs an AJAX call to the highlights controller creating the new highlight and visually highlighting it on the page. Figure 35 shows the context menu and some selected text. Figure 36 displays popular highlights for a note.

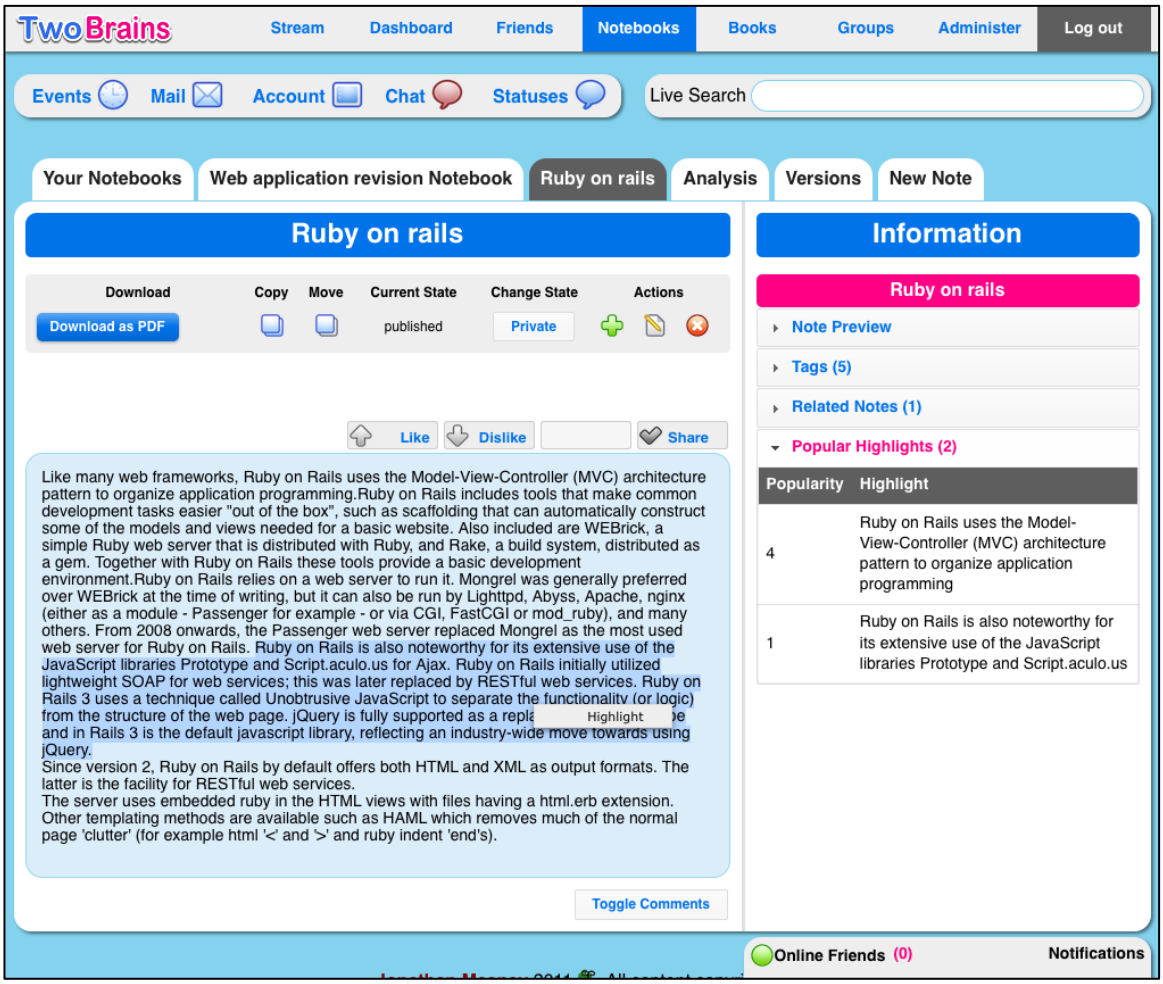

Figure 35: Note highlighting

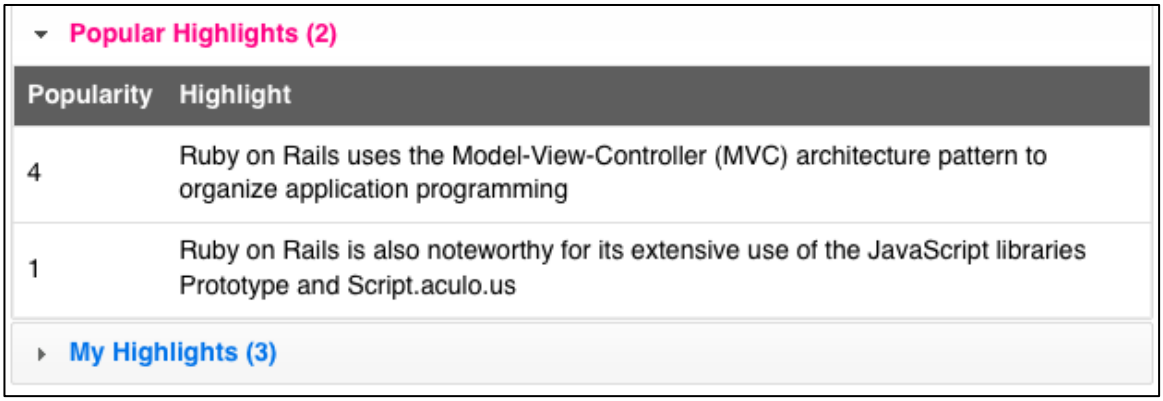

Figure 36: Popular highlights

4.8.3 Updating tagging

In TwoBrains one tagging support was added to models by using the Acts as Taggable plugin. It was necessary to add this functionality to each of the appropriate models in TwoBrains 2 to allow for a greater tagging environment to be created.

To further implement tagging a tagging controller was created with actions for displaying tags. A view was created to visualize a tag and all content associated with it. To further improve this feature and make it easily found each tag displayed to the user across various views was converted into a link to the tag show view where all content associated with that tag would be displayed. This view easily makes all new content available to the user concerning a certain topic and can creating increase their educational experience. Figure 37 displays the tag show page.

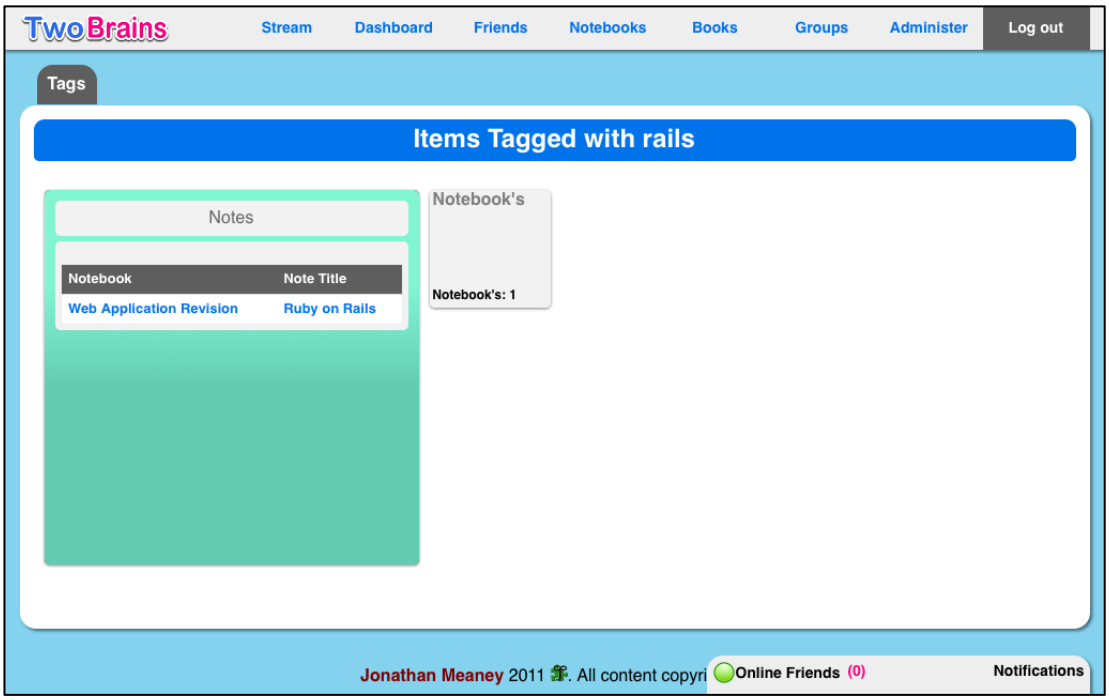

Figure 37: Showing content for a tag

4.8.4 Chat

One of the important modes of communication gleaned from the research was that of instant live chats. These help increase the level of discourse between users and also helps them to become more affiliated. In terms of TwoBrains 2 a chat is a view that is only accessible to users that have been invited and accepted as members. It is a live sharing and collaborative environment. In this view a user can instantly share messages with the other users of the chat, these messages being saved for future use. To access the chat section of TwoBrains 2 the user needs to select the chat option from the secondary section bar.

To implement this feature the Juggernaut Ruby on Rails plugin was used. This plugin integrates a push server with an application and can deliver content to a client in real time. The plugin provides many methods to incorporate the functionality into an application.

4.8.4.1 Creating chats

To begin implementation of the chat functionality a chats controller and a chat model were created. The chats controller contained typical actions to create, update and destroy a chat. A chat model object contains a title, description and creating user.

The views for creating a chat are similar to those for creating an event. Chats also implement an invitation system like that seen in the events section. When creating a chat a user can invite friends. Until that friend accepts they will not be able to gain access to that chat. A chat_member model was created to keep track of chat members and their status. Views similar to those used in the events

section were created to allow users to view their invitations and accept or decline as they see fit.

4.8.4.2 Viewing chats and chatting

The appropriate views and actions were implemented to view a created chat and verify that the current user was a member. The show view was updated with the appropriate functionality to make it a live entity for the Juggernaut push server to push content to. A new action called send_data was added to the chats controller. This action uses Juggernaut functionality to facilitate the sending of content to different clients. An AJAX enabled live form was added to the show view that interacts with the send_data action. Data input into this form will be broadcast to the appropriate clients to see. Figure 38 displays two users chatting in a chat.

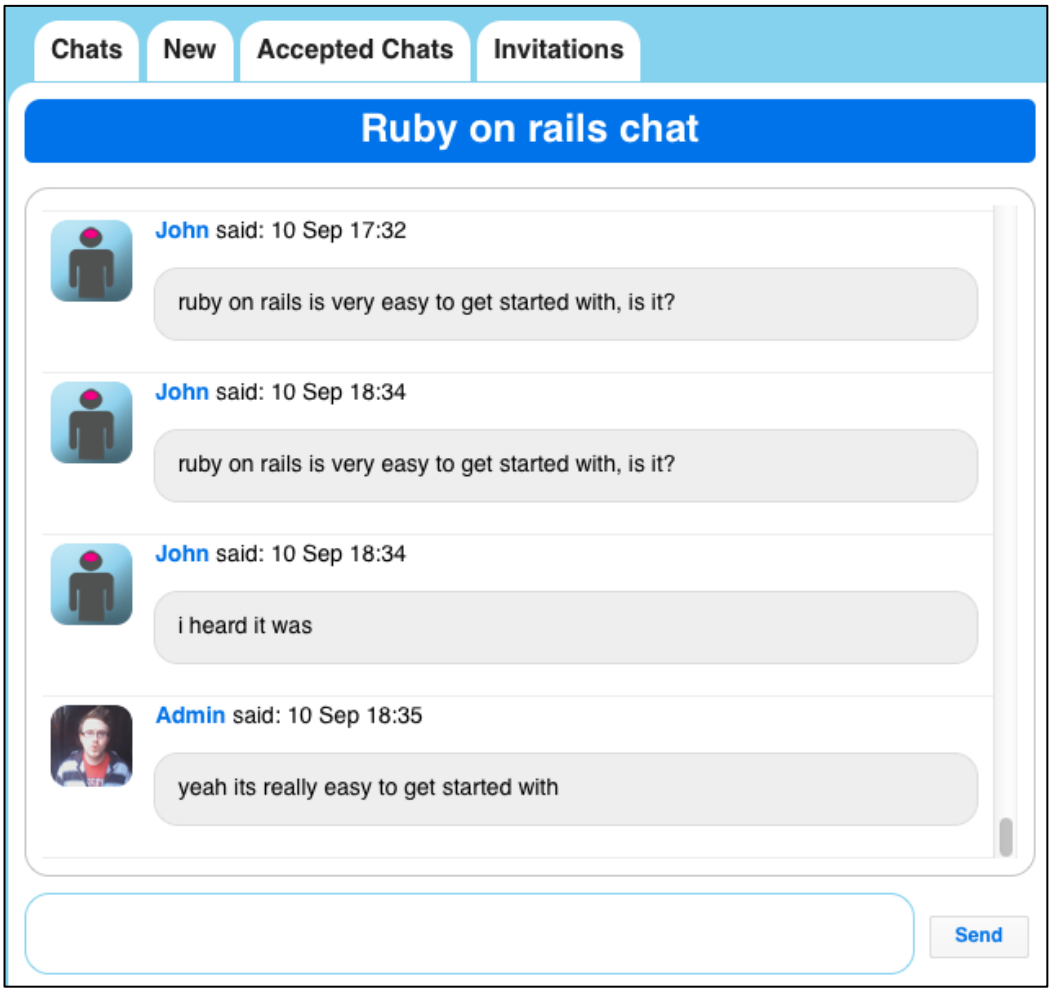

Figure 38: Users chatting

To make the messages users send to each other persistent a chat_message model was created to record all the necessary information and re-display it in the chat when freshly loaded by a user.

4.8.4.3 Sharing links

A system of link shared was created to allow users to easily share content they find on the Internet with the other users of a chat. Three types of link are supported: YouTube links, Wikipedia links and general web links.

A sharing pane was created in the chat show view to easily separate out shared content from the other messages. To save links in a chat a new model was used. The chat_link model records the links that are shared in a chat along with their content. Figure 39 displays a chat with its sharing pane.

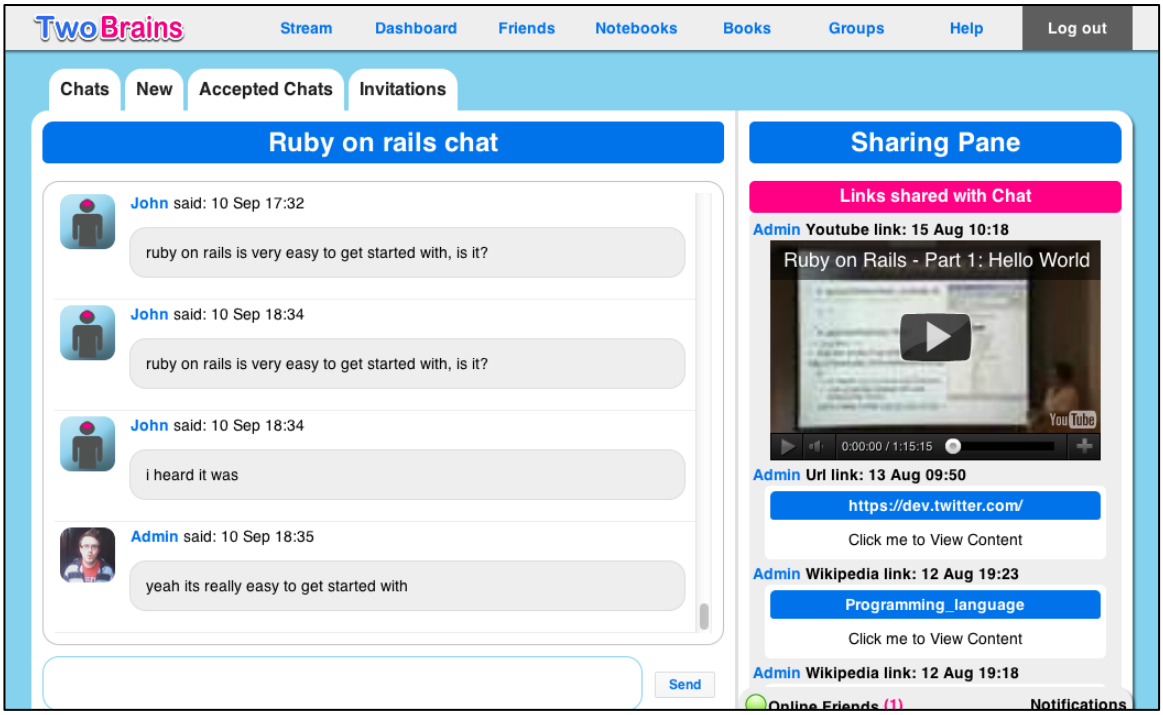

Figure 39: Sharing pane

To implement the sharing of YouTube videos the send_data action of the chats controller was updated with new functionality. When the action receives new content it is scanned for a URL. If the URL is a YouTube URL the Hpricot gem will extract the ID of the video, embed it into a pre defined YouTube video partial and then update the sharing pane with the video.

Sharing Wikipedia links is more complex than sharing YouTube links. To add another dimension to link sharing it was necessary to not only provide the link to

the user but also the content it was a link to. To provide this feature for Wikipedia links the Wikipedia Client Ruby on Rails plugin was used. This plugin will return the content of a Wikipedia page to the application. Extra functionality was added to the send_data action to scan for a Wikipedia link. When one is found its content is retrieved by the Wikipedia Client plugin. The content however is not very useful as it is in Media Wiki markup. The Wikicloth Ruby on Rails plugin is then used to convert this content into pure HTML. This HTML is further sanitized with the Sanitize Ruby gem to produce the desired HTML. This html is then saved along with the link in the chat_links table. The finalized HTML is embedded in a pre defined Wikipedia partial as a clickable item and inserted into the sharing pane. When clicked a jQuery modal dialog will appear containing the refined HTML of the Wikipedia page. Figure 40 illustrates this behavior.

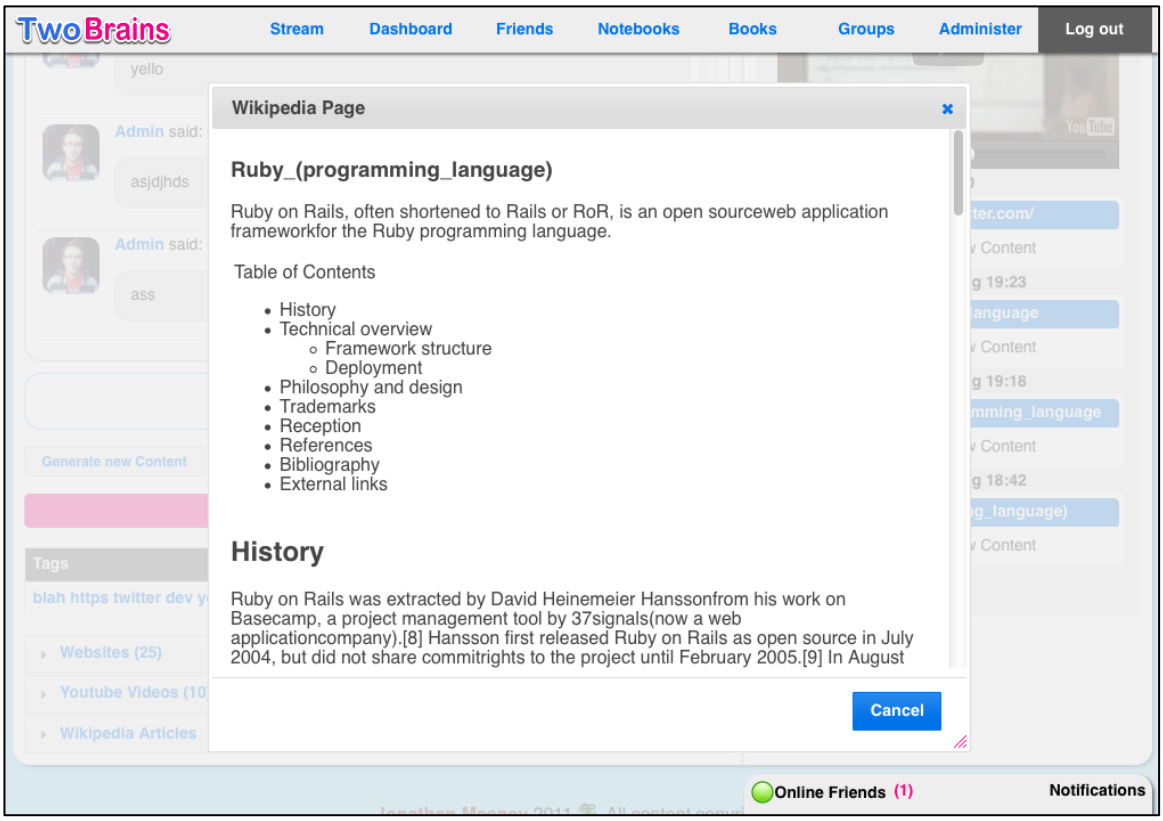

Figure 40: Sharing Wikipedia links

Sharing of links to any other website is also supported. If the send_data action detects a URL but it is not YouTube or Wikipedia then it will implement the appropriate functionality. A helper method was created to accept a URL and then use the Httparty Ruby gem to extract the HTML from that URL. The HTML that is returned is sanitized by the Sanitize Ruby gem and saved to the database. The finalized HTML is them embedded in a pre defined partial and inserted into the sharing pane. This type of link shares the same functionality as a Wikipedia link in that when it is clicked the HTML content of the link is displayed to the user in a jQuery modal dialog.

This interactive sharing of content ensures users can remain focused on the task at hand by drawing in external resources and making them readily available to anyone using the chat.

4.8.4.4 Generating extra content

To add even more helpful data to the chat a new set of functionality was developed to suggest new and helpful external content to the users of the chat. To accomplish this it was necessary to analyze the conversation of the chat members and determine what the topic of conversation is. A helper method was created to accept a set of keywords and gather Delicious and YouTube content using the previously defined get_delicious_feed and get_youtube_feed helpers.

The user can initialize a search for additional content by pressing the generate new content button located under the chat input field. If enough conversation has occurred and an accurate set of keywords can be generated the extra content will be acquired. This extra content will then be inserted seamlessly into the view for the chat members to use. This new content will be continuously available after a generation. Figure 41 displays this functionality.

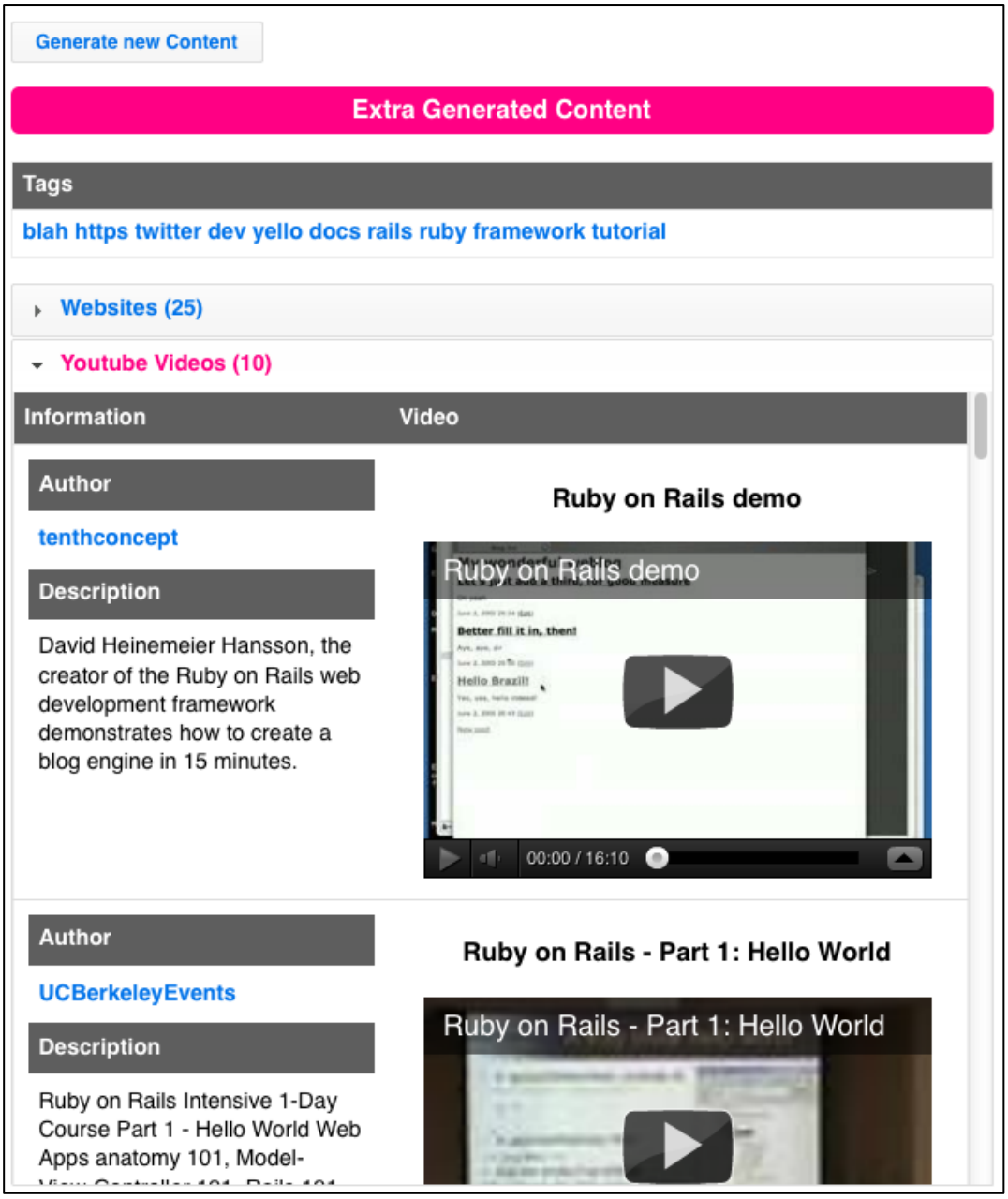

Figure 41: Generating extra chat content

4.8.5 Content Management

An effective and feature rich way for users to manage their TwoBrains content needed to be implemented. To accomplish this task the dashboard section of TwoBrains was expanded with several new views associated with corresponding dashboard controller actions.

4.8.5.1 Content management process

A process and set of design elements were devised to implement the content management system. These elements remain consistent between the different areas of content management.

Each view is divided into two sections, a main content area and a secondary content area. This is a mirror of the main layout of TwoBrains. Figure 42 displays the layout and functionality of content management using chat as an example.

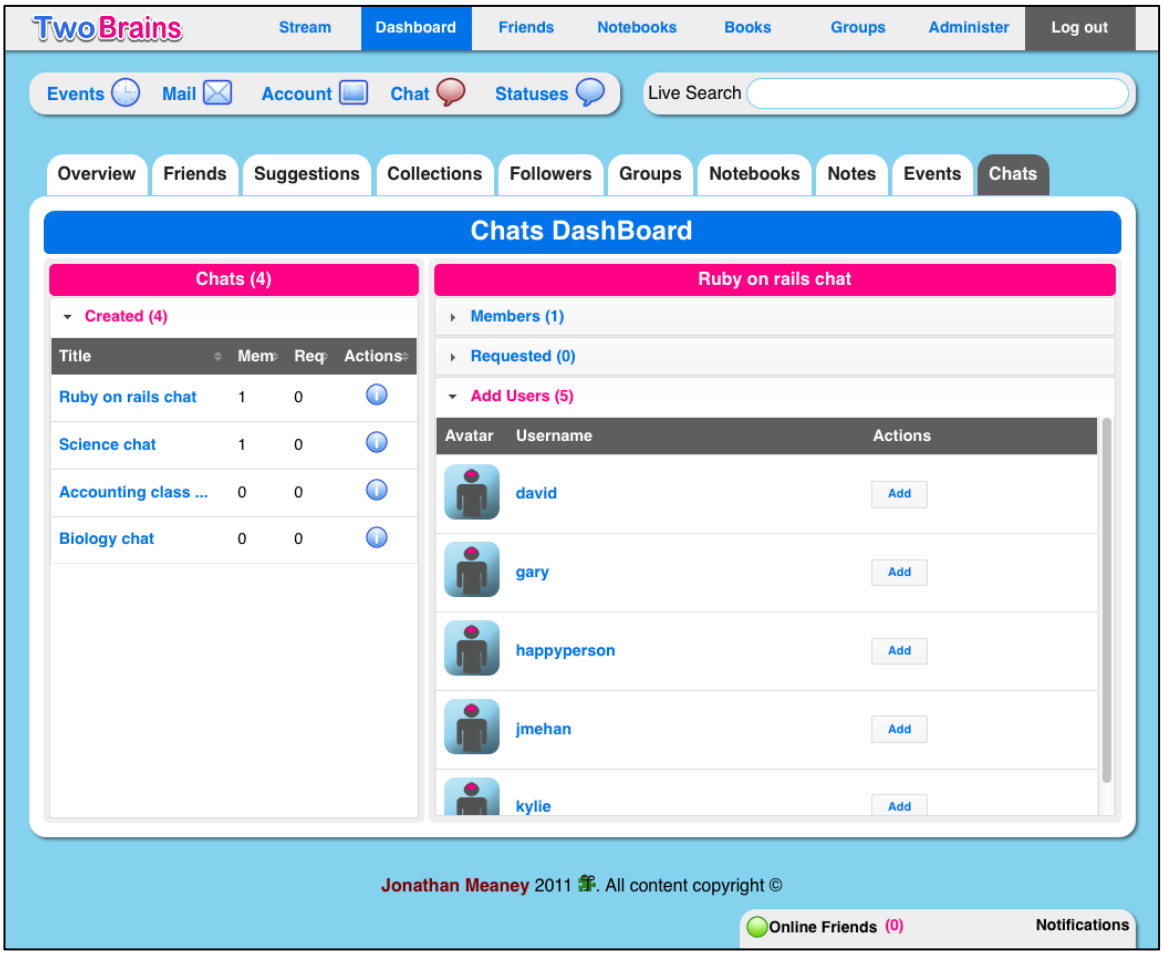

Figure 42: Managing content layout

The process for managing content is extremely simple. The user is presented with their content for a specific section in the secondary column. When they select an item the main column will automatically update with information and applicable actions for that content. In the case of chat above the user is presented with the chat members, friends they have invited and a list of their other friends. It is extremely easy to remove members or requested from a chat using this view. It is also extremely easy to quickly request additional members by choosing the add option from the add users panel.

The management process remains constant across the other manage views with some varying options due to the different requirements of different sections in TwoBrains. The groups section was updated to include a membership system. This meant that a user must request membership for a group and be accepted by the group creator before they can gain access to any of the content associated with the group. This process is similar to the invitation system of chats and events. The user can manage their groups and group memberships from the groups tab of the dashboard. Figure 43 displays the group management system which provides the user with options to accept prospective members, suspend or remove active members and remove content that has been associated with the group.

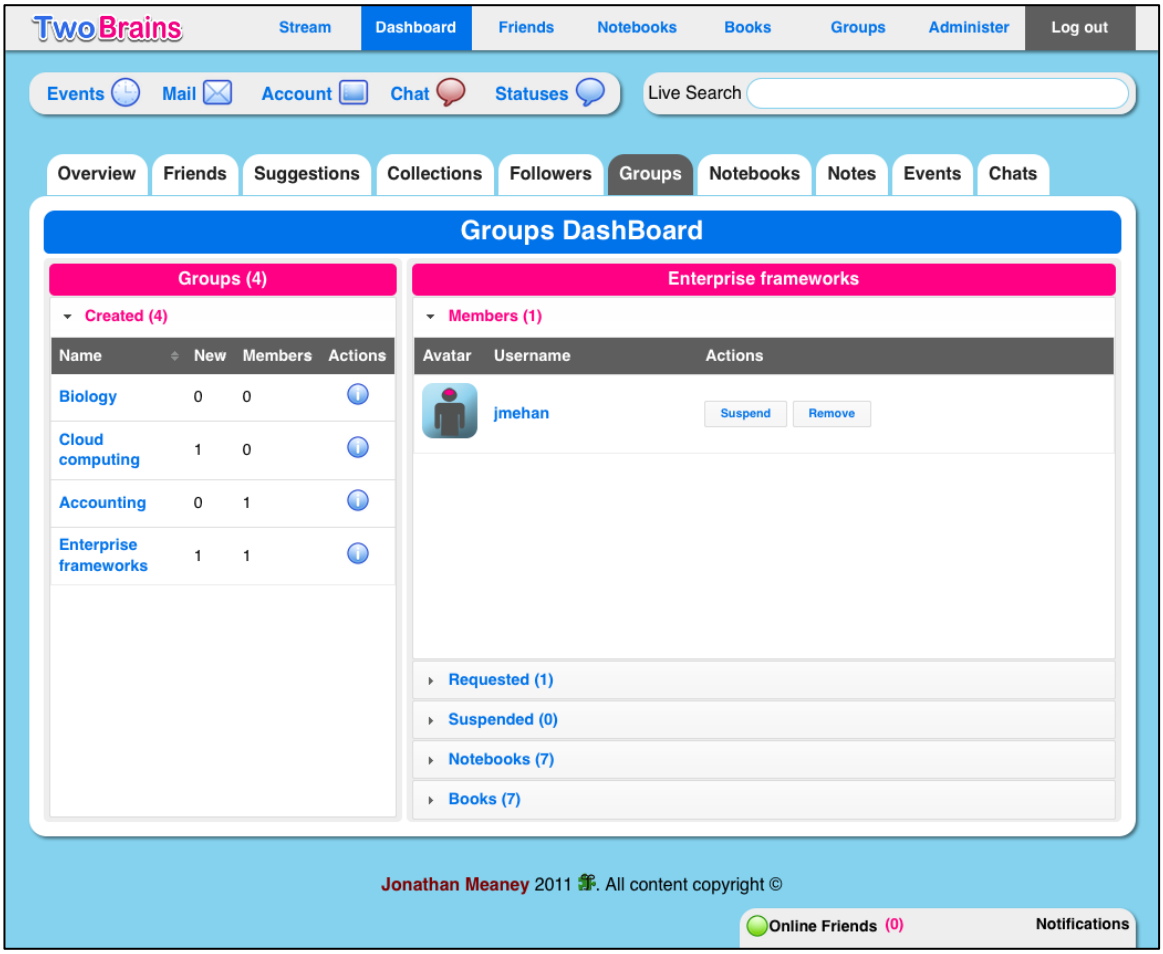

Figure 43: Managing groups

The notebooks and notes tabs provide the user with the option of adding friends to a list of users that have permissions to carry out certain tasks. A permitted user of a notebook can view a notebook and its contents even if it becomes private. A permitted user of a note can perform edits and updates of that note with the changes made being monitored. This allows for greater collaboration to take place between users working together. Extra views were added to the notebooks section that display a list of notebooks and notes that the user currently has permission to edit. This allows for quick access to content the user has permissions to. Similar to the groups management system users can be added, suspended or removed from having permissions.

4.8.6 Miscellaneous updates

There are some small additions to TwoBrains 2 that can be classed as miscellaneous and will be discussed briefly.

4.8.6.1 Online friends quick actions

A quick action feature was added to the online friends bar. This quick action allowed for the user to send a message to an online user from any view in the application instantly. To house the quick action functionality a quick_action controller was created with appropriate actions to facilitate the sending of a mail to the online user.

A jQuery modal dialog was created to provide the user with the message creation form. This form is a simplified version of the form present on the compose mail view. Figure 44 illustrates sending a quick mail to another online user.

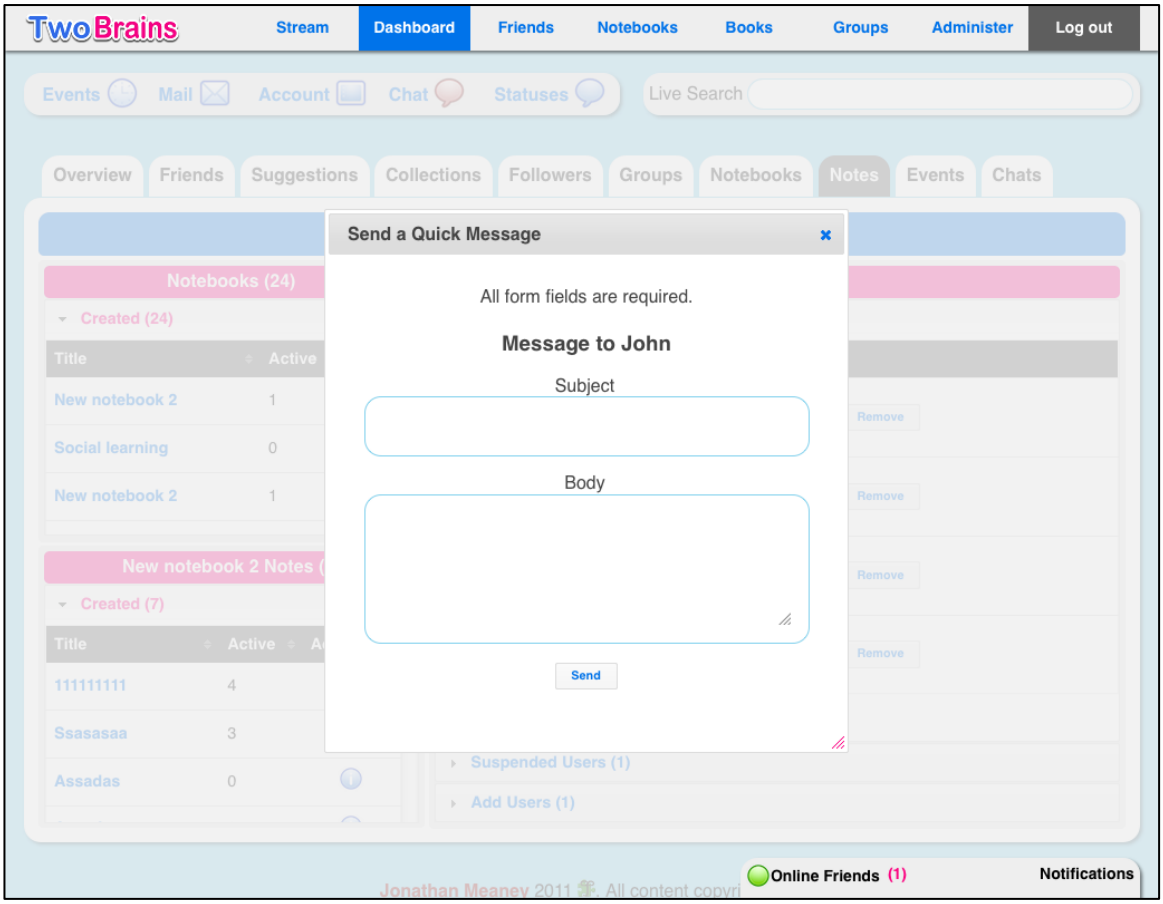

Figure 44: Sending a quick mail

4.8.6.2 Dashboard overview update

To fully being in line the dashboard with the new features of TwoBrains 2 the dashboard overview needed to be updated with extra content. This view was enhanced to provide new access to mail, events and chats along with functionality to interact with them directly. Figure 45 displays the finalized dashboard overview.

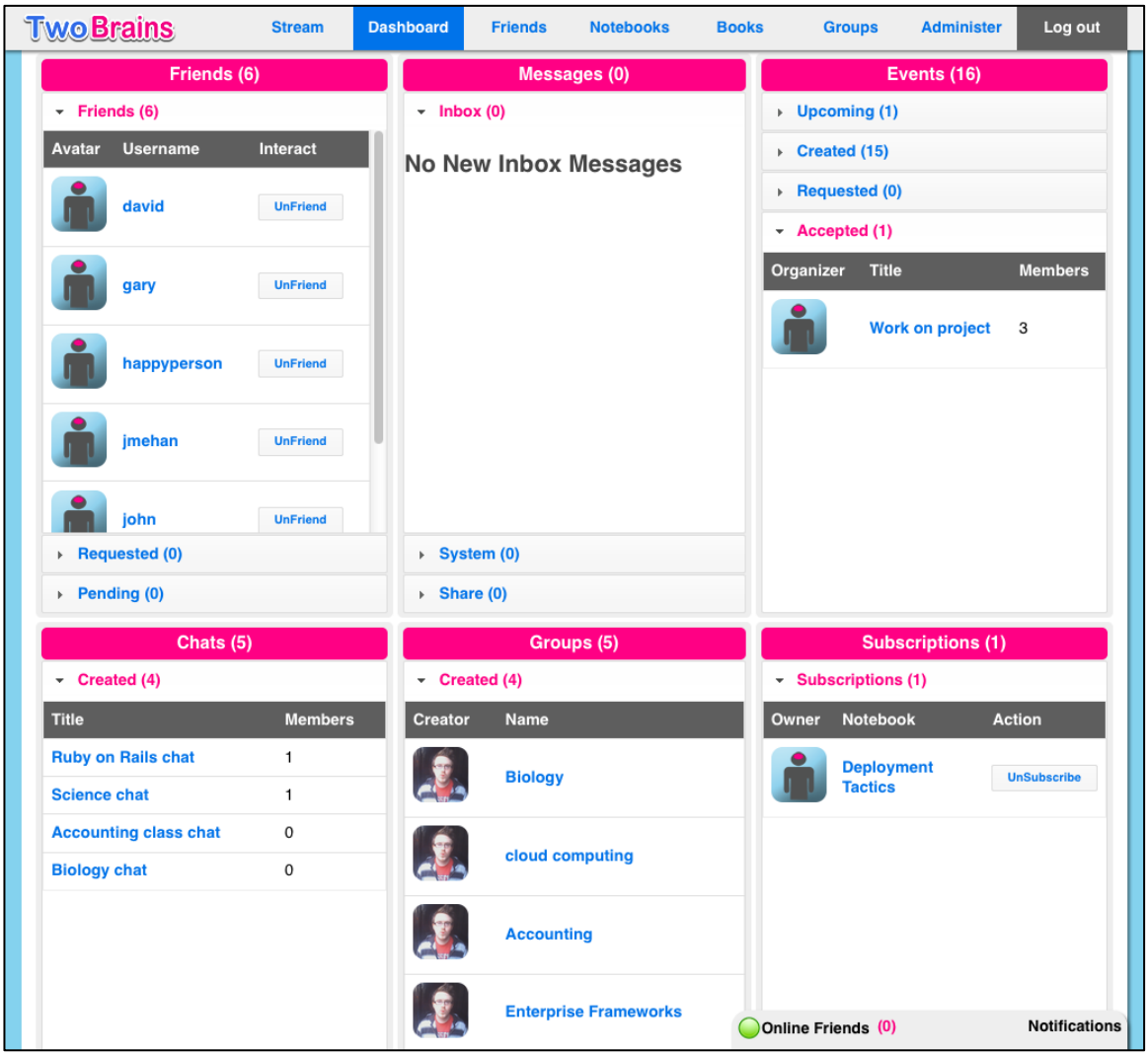

Figure 45: Dashboard overview

4.9 Conclusion

The implementation of TwoBrains 2 was a complex but enjoyable task. The functional and non functional requirements were extracted from a thorough investigation into social networks and learning enables social networks. The optimal design characteristics and features were integrated into the application to create a more rounded educational and social experience for the user.

The rapid application development methodology suited the development of TwoBrains 2 as it promotes the quick sucession of functional implementation. Three distinct prototypes were created but many more smaller ones were also created during the duration of the development and implementation cycle.

TwoBrains 2 has become a fully featured Learning Enabled Social Network, intent on providing an excellent learning experience to its users. While using the many features designed to aid in social and intellectual development a user will not only gain knowledge but also a new social circle to which they belong. TwoBrains has become the embodiment of the findings gleaned from the research conducted in the specified domains. Its components and design have been optimally implemented to fulfil the requirements of a LESN.

5. Evaluation

5.1 Introduction

In evaluating the implemented application and conducted research two procedures for data gathering were used. The sample set of users chosen to evaluate the system consisted of 20 individuals of varying computer skills. Each of the testers were aged from 21 to 30 and held different occupations varying from student to financial accountant.

5.2 Method

Two methods of data gathering were used in evaluating TwoBrains 2. These methods produced data that was recorded and analyzed in order to produce and effective overview of the results.

Survey:

A survey was created containing general questions concerning the user's computer ability and if they use the Internet for activities such as social networking or eLearning. The questions asked to the tester are present in Appendix A. The survey was carried out on a group of 20 testers with each of their answers and comments being recorded.

Questionnaire:

When the final prototype of TwoBrains 2 had been created it was necessary to allow the sample set of testers to use the application unhindered and then complete a questionnaire detailing their experiences with the system.

Some initial guidance was given to the testers describing some of the key features and thought behind TwoBrains 2. The testers were then instructed to use the system as they would any other social network site, engage with its learning features and gauge its effectiveness in providing an efficient learning and social experience.

The questionnaire contained 20 agree/disagree questions in which different aspects of the system were being questioned. 10 other more descriptive questions were also asked of the tester, these ones containing comment boxes allowing them to fully express their feelings on that particular subject.

The results of the questionnaire were recorded and correlated with other testers. In total 20 questionnaires were completed by the different testers.

5.3 Conclusion

In evaluating the application two different methods were used each with specific goals in gathering data. The survey was an excellent tool in establishing an overview of the state of mind of the tester and the questionnaire was an excellent tool in gauging the testers opinions of the completed system.

6. Results

6.1 Introduction

This chapter discusses the findings from the evaluation carried out on TwoBrains 2. The collected data from the testers was analyzed and interpreted to glean the overall effectiveness of the system.

6.2 Survey results

The survey was used to assess the thoughts and feelings of the testers towards different aspects of TwoBrains 2. The questions asked probe the users thoughts and beliefs on social networks and online learning.

Question 1: “How would you describe your level of computer literacy?”

The survey results brought to light many factors about the sample of testers used to evaluate the application. From the 20 testers 30% had excellent computer literacy. 60% had average and 10 % had poor computer literacy. This wide range of computer literacies afforded the evaluation procedure different levels of experience and thus produced a more substantial result. Figure 46 illustrates the computer literacy of the testing candidates.

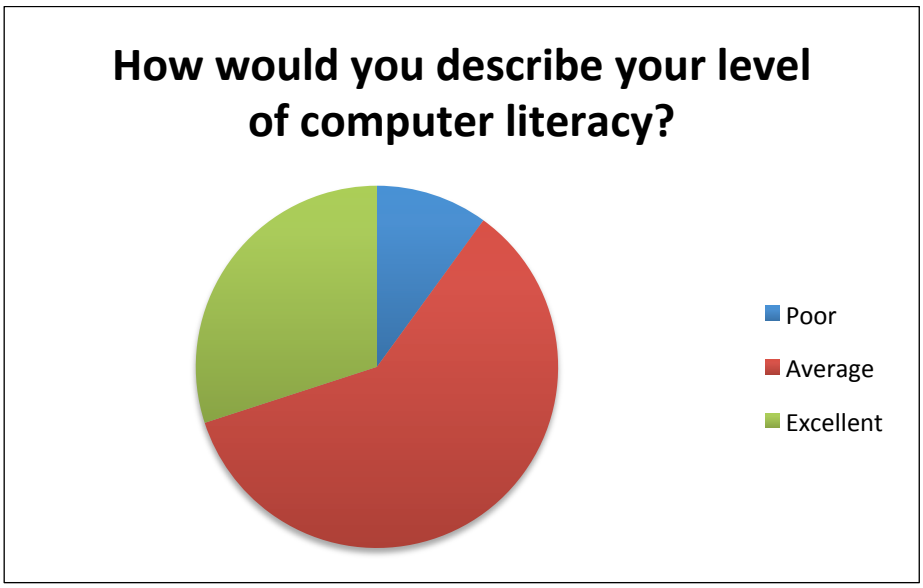

Figure 46: Tester computer literacy

Question 2: "How often do you use social networks?"

The uptake and use of social networks is a key testing area for evaluating TwoBrains 2. The testers were asked how often do they use social networks. 40% use them often, 30% use them everyday, 20% rarely and 10% never. This again provides a wide range of different viewpoints for testing. Figure 47 illustrates the testers usage of social networks.

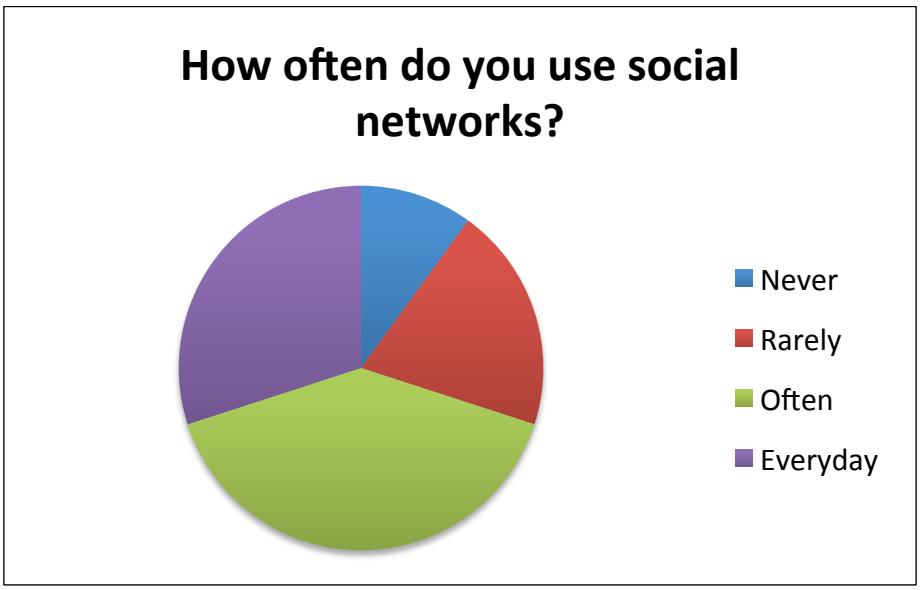

Figure 47: Tester social network usage

Question 3: "Do you use the Internet for learning?"

The educational intent of TwoBrains 2 is an extremely important aspect of the system. Therefore it was required to gauge the testers use of the Internet for learning. From the survey of testers it was found that 35% never use the Internet to fulfill their learning needs, 30% would rarely use it, 30% would often user it and just 5% would use it every day. By using TwoBrains 2 it is hoped that these percentages will rise. This is illustrated in figure 48.

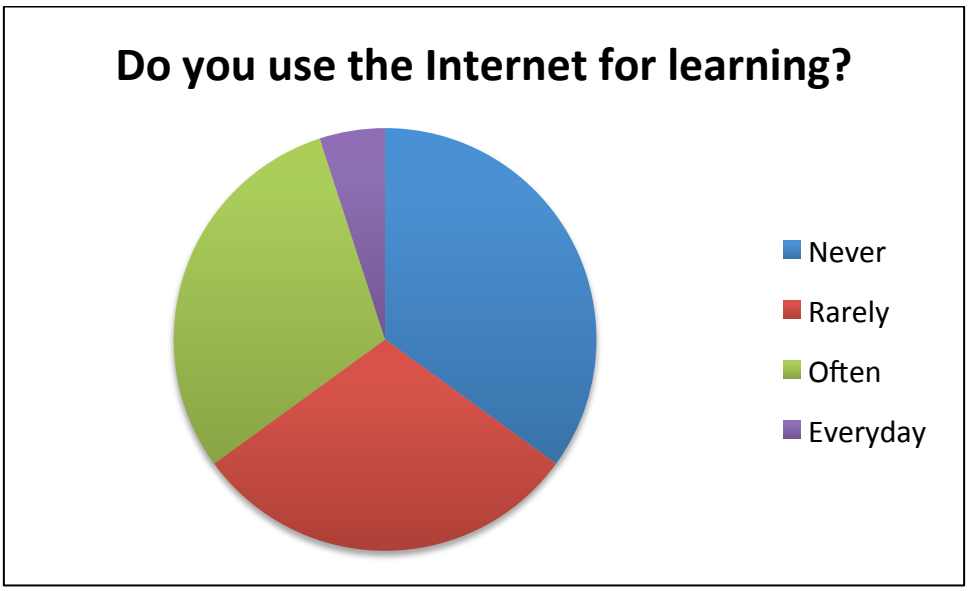

Figure 48: Testers user of Internet learning

Question 4: "What features would you use most in a social network?"

To determine the testers most used features of a social network they were asked to select the appropriate options. From this we can see that status updates, finding friends, messaging, chat and liking/disliking content were the most popular. This result displays the characteristics a user expects to see from a social network. Figure 49 illustrates the popularity of SNS features.

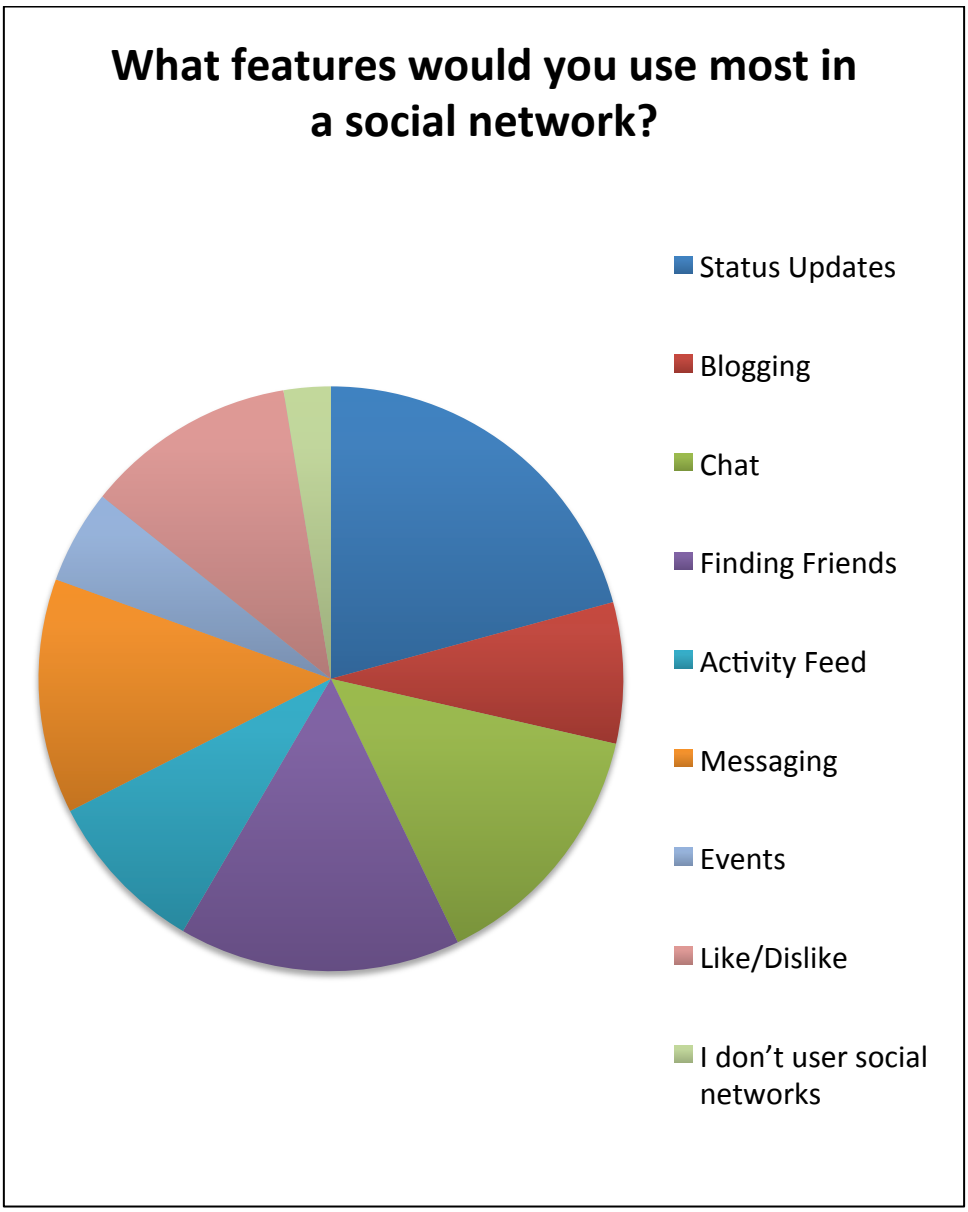

Figure 49: Testers most used social network features

Question 5: "Do you think a social network could be used for learning?"

Finally the testers were asked if they believed a social network could be used to provide an effective learning experience. The results of this question show that 80% of the testers believed that it could while 20% believed that it could not. The 20% that believed it could not commented that some features of a social network

might distract from the learning experience. Figure 50 displays the results from this question.

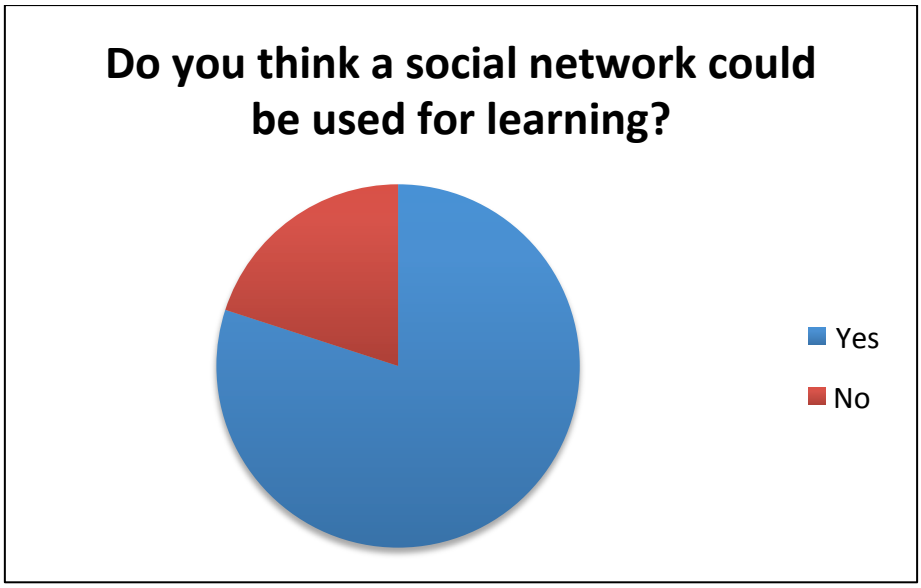

Figure 50: Testers opinion on using a social network for learning

6.3 Questionnaire results

The results of the questionnaire provided much insight into the thoughts of the tester. This section will review the most important results gleaned from the questionnaire data.

6.3.1 General comment statements

When presented with the following comment questions the testers provided excellent insights into their thoughts of the system. The following three statements are used to allow the tester to truly voice their opinions.

Statement 1: ***"What would you use the web site for?"***

Statement 2: ***"What do you think is the best feature of this website and why?"***

Statement 3: ***"How does this website compare to other social networks?"***

When asked the general comment question *"What would you use the web site for?"* the testers responded with various comments. Generally the testers said they would use the application as a learning tool to enhance their educational attainment. Some testers responded that they would use the application purely as a social network to maintain contact with friends. No testers said they would not use the application.

From the comments provided the best feature of the system was obtained. The testers believed that the ability to chat feature of TwoBrains 2 was the best. They liked how the system could identify the topic of conversation and present them with extra external content. Sharing links with the chat and having the content displayed directly from the window was also seen as a good feature of TwoBrains 2 chat.

The testers comments showed that they felt comfortable with the system and understood some of its mechanics due to similarities to other social networks they had used. Some of the features they believed were welcome additions and upgrades to previously seen features such as chat and mail.

6.3.2 Interface design statements

The interface design statements gauge the testers response to the user interface of TwoBrains 2. The following three multiple-choice statements were used to assess the testers feelings on the design, features and layout of TwoBrains.

Statement 4: ***"The pages on this website are attractive"***

Statement 5: ***"This website has some annoying features"***

Statement 6: ***"This website seems logical to me"***

The responses to statement 4 were extremely encouraging. All 20 testers agreed that the pages of TwoBrains were attractive. This shows that the stylistic design of the interface was a success.

Another excellent response was gained from statement 5. 100% of the testers disagreed with that statement meaning that the features provided by TwoBrains are designed efficiently and do not aggravate the user.

When presented with statement 6 the testers mostly responded positively. 90% of the testers agreed with the statement whereas 2 testers did not. The reason they provided for this was that they did not have much experience with social networks or the Internet so the application was slightly alien to them. Figure 51 illustrates this statement.

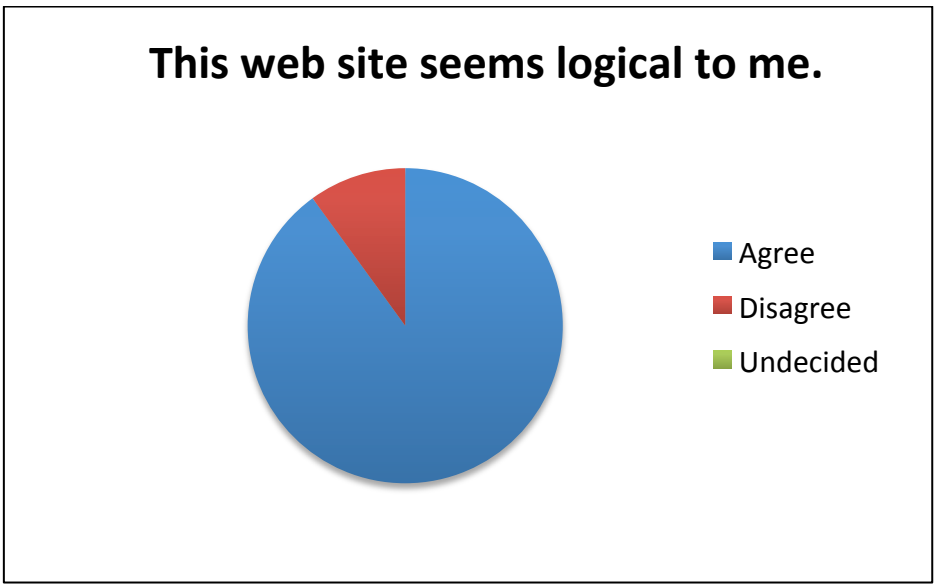

Figure 51: Testers statement 6 response

These statements provided some interesting responses to the design of TwoBrains. It was shown that the visual design of the interface and the features it offers are highly agreeable with users.

6.3.3 Navigation statements

Assessing the navigation of the application ensures that each section is easily navigable to and that each navigation action produces the correct results. The testers were presented with the following four multiple-choice statements that assess the users opinion of how the application flows.

Statement 7: ***"It is difficult to move around this website"***

Statement 8: ***"Learning to find my way around this website is a problem"***

Statement 9: ***"Remembering where I am on this website is difficult"***

Statement 10: ***"I get what I expect when I click on things on this website"***

The testers responses to statement 7 were positive. 95% of the testers disagreed with the statement with 1 tester agreeing. This tester believed the statement to be true due to their lack of familiarity with websites in general. To improve this extra help should be given to first time users on how they can best navigate the system.

Statement 8 provided a similar response to statement 7. 95% of testers disagreed with this statement with 1 tester agreeing. This again was due to the testers lack of experience with websites. As previously stated extra care and attention could be given to first time users in best navigating the application.

When presented with statement 9 100% of users disagreed which shows that even for the testers that did not have much experience with websites could easily see what section of the application they were using. This illustrates the well-defined and implemented navigation system used in TwoBrains 2.

Statement 9 also produced extremely positive results with 100% of testers agreeing with the statement. This again shows that the interface navigation system is logical and easy to use.

These statements probed the testers ability to navigate the application. The results indicated that users without much experience of websites could struggle to initially navigate the system. These users did however understand where they were and what they might expect from selecting different navigation options. This result shows that the navigation system of TwoBrains is well developed and logical to the user.

6.3.4 Usability statements

The following five multiple-choice statements were presented to the testers to gauge their opinion on the overall usability of the system. Usability is a key concern for any application and as such these statements are extremely important.

Statement 11: ***"I can quickly find what I want on this website"***

Statement 12: ***"This website needs more introductory explanations"***

Statement 13: ***"I can easily contact the people I want on this website"***

Statement 14: ***"Using this website for the first time is easy"***

Statement 15: ***"This website is too slow"***

When presented with statement 11 100% of the testers agreed that they could quickly find what they were looking for. Even the testers with limited experience found it easy to use the prominently positioned live search feature and quickly browse the results.

Statement 12 gauged the users response to the effectiveness of the help section of TwoBrains 2. The results show a distinct split in opinion with 65% of testers disagreeing and 35% of testers agreeing. The reasons the testers provided for agreeing were related to the amount of features provided by TwoBrains 2. The testers felt that more time and effort needed to be afforded for the help section in order to produce something that was much more useful in terms of trouble shooting and explaining what each of the features can do. Some testers who were unfamiliar with social networks also found it hard to relate to some of the features found in TwoBrains and requested extra guidance added for their benefit. Figure 52 illustrates this split in user opinion.

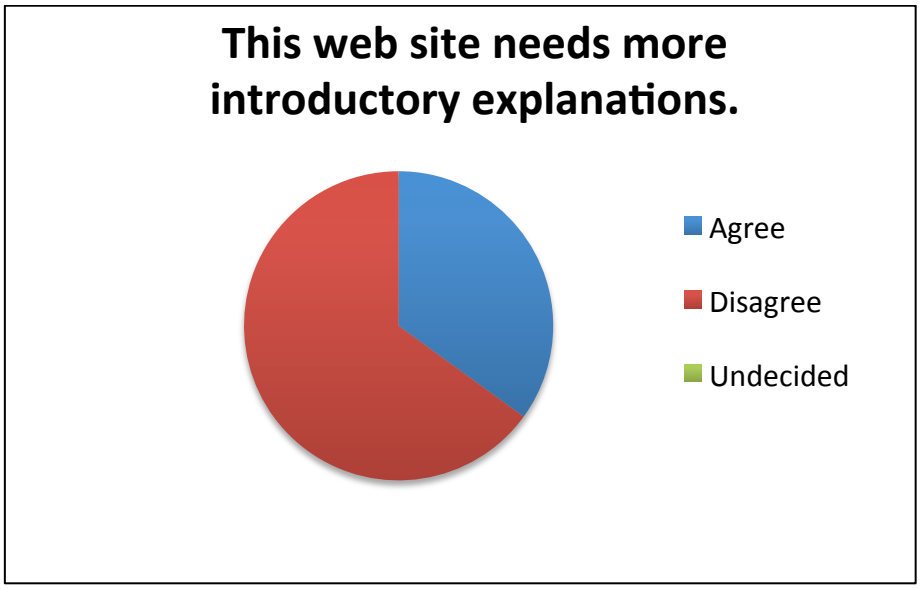

Figure 52: Testers statement 12 response

The testers provided positive results to statement 13. 100% of tested agreed that they could easily contact the people they wanted. The many methods of communication provided by TwoBrains enable a user to easily contact another user using different methods. The testers found the mail section to be extremely functional and provided similar features to email applications they had previously used.

Another split in tester opinion occurred when presented with statement 14. 85% of testers agreed that using the application for the first time was easy whereas 15% disagreed. Again this disagreement arose from the lacking in detailed help provided by the help section. Appropriate measures should be taken to provide all users with a helping hand in getting started with TwoBrains, especially those that are uncommon users of the Internet. Figure 53 illustrates the split in tester opinion for statement 14.

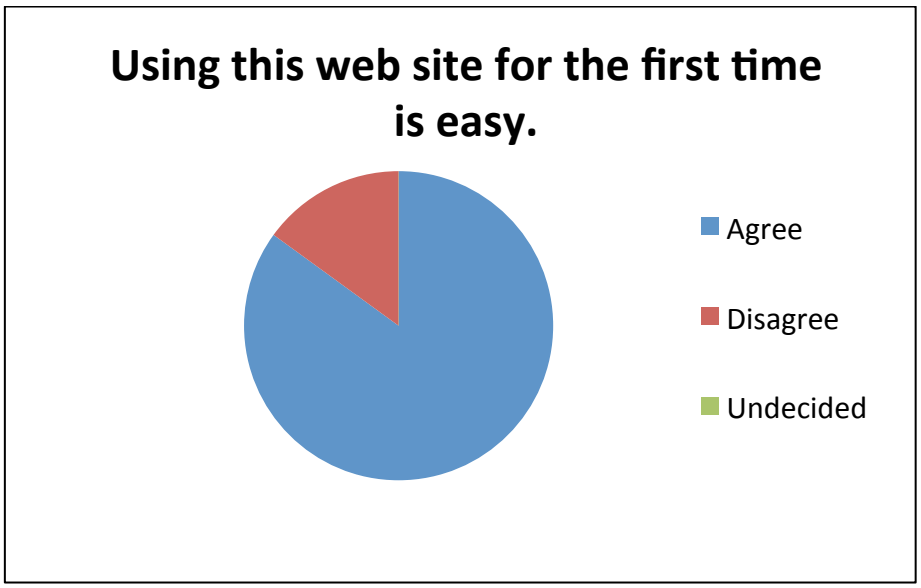

Figure 53: Tester statement 14 response

Statement 15 gauged the testers response to the speed of the application. 100% of the testers disagreed that the website was too slow. This shows that TwoBrains 2 provides a fast and efficient service and does not impede the users activities.

From the usability statements TwoBrains has been found to be extremely usable by the testers. Some aspects of the system were found that could be improved in order to provide an even better user experience. In ensuring a fully featured and rounded help section is provided users of all abilities should be able to engage with the system instantly.

6.3.5 User opinion statements

The following five multiple-choice statements were presented to the testers to ascertain their general opinions of TwoBrains. These statements are important in ensuring that the application provides a suitable environment for all users.

Statement 16: ***"This website has much that is of interest to me"***

Statement 17: ***"I feel in control when using this website"***

Statement 18: ***"I feel efficient when using this website"***

Statement 19: ***"It is difficult to tell if this website has what I want"***

Statement 20: ***"How important for you is the website you have been reviewing?"***

Statement 16 was used to obtain the testers opinion on how much interest TwoBrains was to them. 100% of the testers agreed that the application had much to interest them. Even the testers with limited experience with the Internet and social networks agreed that they found many interesting areas of TwoBrains that would wish to use again. This shows that the appeal of TwoBrains can be broad enough to include those that would not generally use such an application.

When presented with statements 17 and 18 100% of the testers agreed that they felt in control and efficient when using the application. The testers that had little experience with social networks and websites found that after they had initially gotten to know the system they felt capable of accomplishing tasks in an efficient way. This shows that TwoBrains' features put the users interests in focus allowing them to complete the task at hand unhindered.

Statement 19 measures the testers opinion on how they can find what they need. 100% of the testers disagreed with this statement implying that the live search feature provided was easy to use and returned results in an understandable way. This proves that TwoBrains can be easily searched and the user can easily access content.

The final statement put to the tester asked how important TwoBrains was to them. 85% of the testers said it was extremely important whereas 15% said they would need it sometimes. This shows that TwoBrains has a widespread attractiveness to users and is appealing to active and casual users. Figure 54 presents the results for statement 20.

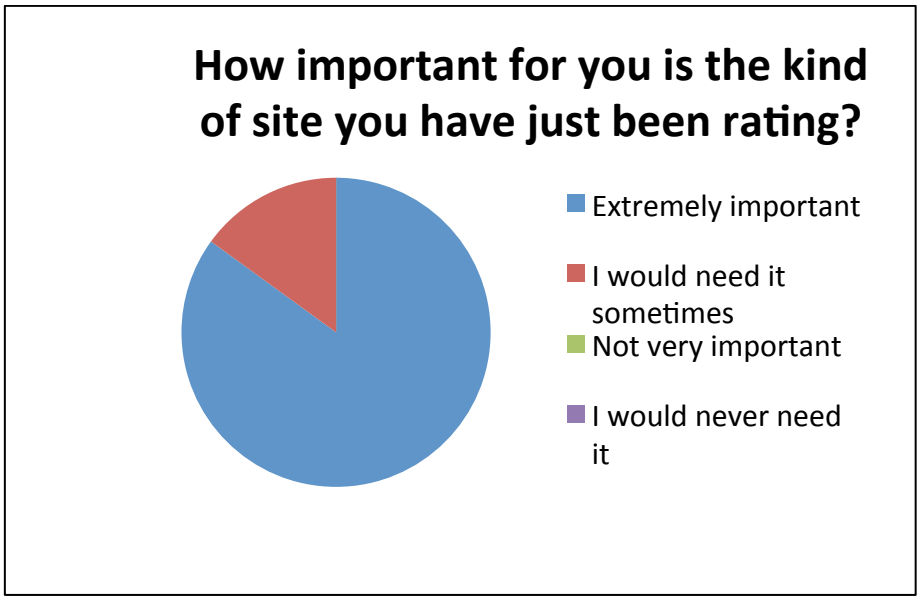

Figure 54: Tester statement 20 response

The opinion statements glean the testers perceptions and estimations of TwoBrains as an application. These results show that the application is appealing to a wide variety of individuals and excellent at making them feel in control of what they are doing. The features provided by TwoBrains afford the user ease in

locating and using the content that is relevant to them at any time. This further shows that TwoBrains has been well implemented and provides a well-rounded set of functionality.

6.4 Conclusion

The survey results gave an excellent understanding into the mindset of the testers testing the application. From these results the most important features of a social network were found, as too were the testers opinions on if eLearning and social networking should be combined. The results also indicated the level of adoption of the LESN by regular social network users.

The questionnaire results indicate that generally TwoBrains is an engaging application with widespread appeal amongst different user groups. The testers responded positively to most of the statements presented to them. There are however some areas of TwoBrains that could be improved, especially to new users of the Internet. Implementing these changes could much improve the approval of the application by various types of user.

7. Conclusion

In answering the question *"What are the components of and optimal design of a Learning Enabled Social Network? (LESN)"* a review of current understanding was directed. The detailed research which was conducted into the domains of social networking, online community, online learning, collaboration and design provided excellent insight into providing the optimal learning experience for users of a Learning Enabled Social Network. The components and design established from the research were employed during the development of TwoBrains 2.

The development and implementation of TwoBrains 2 has been a complex and rewarding task. The development phase of TwoBrains produced three distinct prototypes name 4, 5 and 6 following on from 1, 2 and 3 which were completed as part of TwoBrains 1. The rapid application development methodology again proved extremely useful in fueling the development process. Each of the functional and non-functional requirements have been met and have been fully integrated into TwoBrains 2. The design has been refined and updated to incorporate new components of social and intellectual interaction which have created a highly focused system dedicated to the educational attainment of its uers.

The evaluation of TwoBrains revealed several details about the application. For the evaluation process a sample set of 20 individuals of varying occupation, age and computer literacy were used to access TwoBrains. The data gathered from the testers' evaluation revealed that TwoBrains is an extremely capable application and appeals to a wide array of different users. The characteristics and features of TwoBrains have been found to be extremely usable and efficient at providing a possitive educational experience.

TwoBrains has become a powerful tool in aiding learners fulfil their self directed learning goals. Its many features and functions are designed to continually place the learner at the centre of their educational attainment as well as their social and communal fulfilment. TwoBrains is a true Learning Enabled Social Network.

8. Future Perspectives

The future perspectives for TwoBrains can be divided into two different sections. These sections represent a theoretical and technological future along with an explaination for each.

8.1 Future research

An avenue of possible research could be explored by investigating the effectiveness of TwoBrains at increasing a learners learning experience. This research could employ the use of quantitative and qualitative methods to precisely record a learner's progress with the system. This data could be analyzed to determine the level of their educational attainment.

8.2 Future features

Creating a suite of mobile TwoBrains applications would be an excellent perspective feature. The popularity of smart phones and tablet devices has become so great over recent years that nearly every individual has one. Having the TwoBrains mobile application on their android, iOS or tablet device would allow the learner to easily remain in contact with and interact with the system at all times. Other additions to TwoBrains could add support for video and voice communications. This feature could further enhance the learners educational attainment and provide them with new means of communication and learning.

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Appendices

Appendix A: Survey

1. How would you describe your level of computer literacy?

- ○ Poor
- ○ Average
- ○ Excellent

Comments

2. How often do you use social network sites?

- ○ Never
- ○ Rarely
- ○ Often
- ○ Everyday

Comments

3. Do you use the Internet for learning?

- ○ Never
- ○ Rarely
- ○ Often
- ○ Everyday

Comments

4. What features would you use most in a social network?

- ☐ Status Update
- ☐ Blogging
- ☐ Chat
- ☐ Finding Friends
- ☐ Activity Feed
- ☐ Messaging
- ☐ Events
- ☐ Like/Dislike
- ☐ I dont use social networks

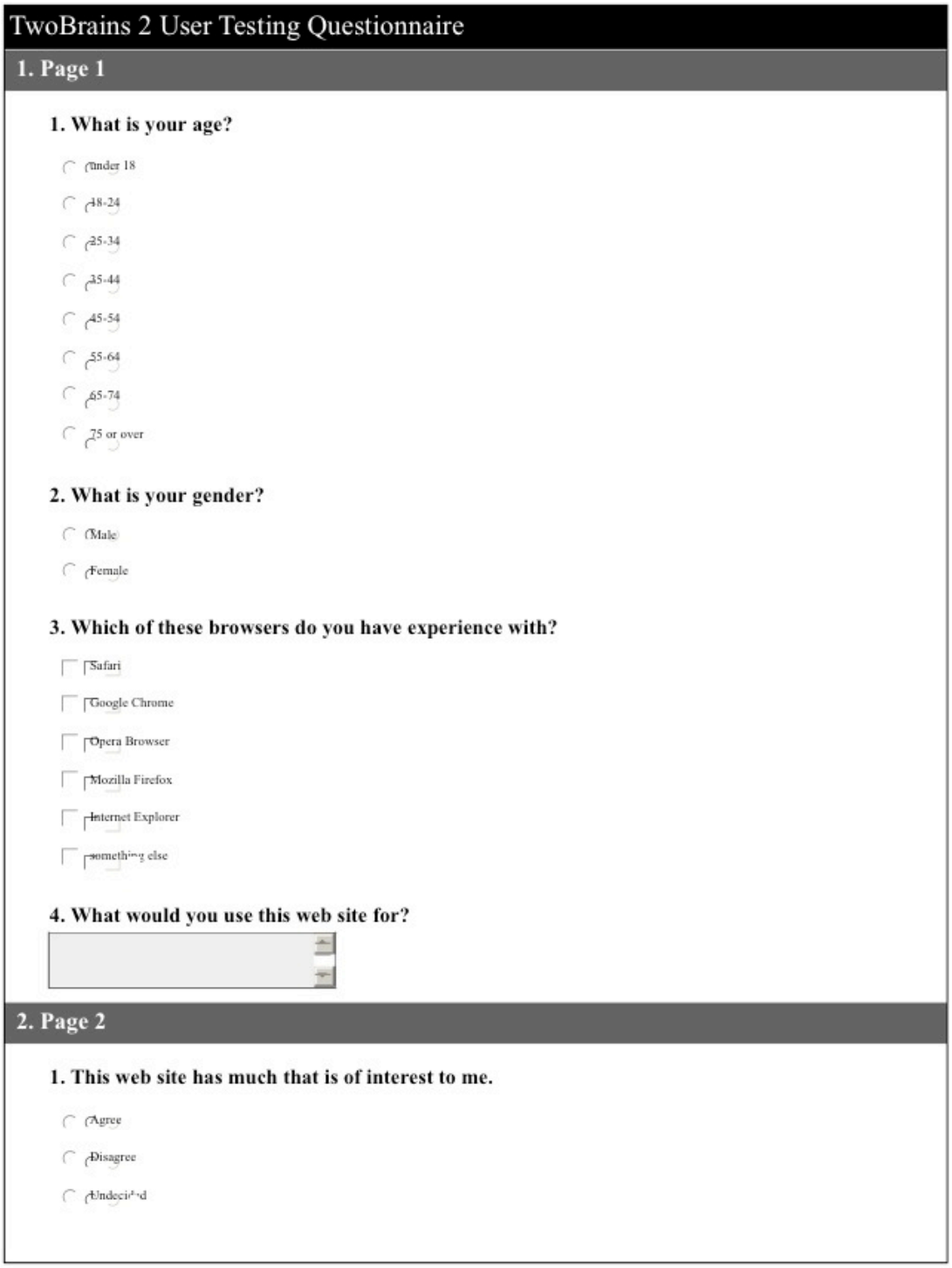
Comments

5. Do you think a social network could be used for learning?

- ○ Yes
- ○ No

Comments

Appendix B: Questionnaire



TwoBrains 2 User Testing Questionnaire

1. Page 1

1. What is your age?

- Under 18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65-74
- 75 or over

2. What is your gender?

- Male
- Female

3. Which of these browsers do you have experience with?

- Safari
- Google Chrome
- Opera Browser
- Mozilla Firefox
- Internet Explorer
- something else

4. What would you use this web site for?

2. Page 2

1. This web site has much that is of interest to me.

- Agree
- Disagree
- Undecided

TwoBrains 2 User Testing Questionnaire

2. It is difficult to move around this web site.

- Agree
- Disagree
- Undecided

3. I can quickly find what I want on this web site.

- Agree
- Disagree
- Undecided

4. This web site seems logical to me.

- Agree
- Disagree
- Undecided

5. This web site needs more introductory explanations.

- Agree
- Disagree
- Undecided

6. The pages on this web site are very attractive.

- Agree
- Disagree
- Undecided

7. I feel in control when I'm using this web site.

- Agree
- Disagree
- Undecided

8. This web site is too slow.

- Agree
- Disagree
- Undecided

TwoBrains 2 User Testing Questionnaire

9. This web site helps me find what I am looking for.

- Agree
- Disagree
- Undecided

10. Learning to find my way around this web site is a problem.

- Agree
- Disagree
- Undecided

3. Page 3

1. I don't like using this web site.

- Agree
- Disagree
- Undecided

2. I can easily contact the people I want to on this web site.

- Agree
- Disagree
- Undecided

3. I feel efficient when I'm using this web site.

- Agree
- Disagree
- Undecided

4. It is difficult to tell if this web site has what I want.

- Agree
- Disagree
- Undecided

TwoBrains 2 User Testing Questionnaire

5. Using this web site for the first time is easy.

- Agree
- Disagree
- Undecided

6. This web site has some annoying features.

- Agree
- Disagree
- Undecided

7. Remembering where I am on this web site is difficult.

- Agree
- Disagree
- Undecided

8. Using this web site is a waste of time.

- Agree
- Disagree
- Undecided

9. I get what I expect when I click on things on this web site.

- Agree
- Disagree
- Undecided

10. Everything on this web site is easy to understand.

- Agree
- Disagree
- Undecided

4. Page 4

1. What do you think is the best feature of this website, and why?

TwoBrains 2 User Testing Questionnaire

2. How important for you is the kind of site you have just been rating?

- Extremely important
- I would need it sometimes
- Not very important
- I would never need it

3.How does this website compare to other social network sites?