A study of the use of a social media learning tool in face-to-face college biology class

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A STUDY OF THE USE OF A SOCIAL MEDIA LEARNING TOOL
IN A FACE-TO-FACE COLLEGE BIOLOGY CLASS

by

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DEDICATION

I’d like to dedicate this dissertation to my family team of cheerleaders.

First of all, thank you to my wonderful husband Christopher, who read multiple versions of this dissertation and was always ready to help with computer glitches, and data questions. I could not have completed this dissertation without your constant support. Thank you for walking the dog, doing the shopping and generally keeping life moving forward while I was writing.

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A STUDY OF THE USE OF A SOCIAL MEDIA LEARNING TOOL
IN A FACE-TO-FACE COLLEGE BIOLOGY CLASS

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ABSTRACT

This study endeavors to elucidate how students are using the social media tool, Piazza, in their study of biology and which aspects do they find most valuable. Student perceptions of factors contributing to a community of practice through the use of Piazza were also explored.

Students used Piazza primarily to communicate online with their classmates on both conceptual and administrative issues. Student use of Piazza varied according to the needs of the student with the majority of students accessing the site at least once a week. Students highly valued the ability to read posts left by other students to clarify questions. They especially appreciated the 24/7 online access of the site. Another dimension of accessibility that the students cited was that they often found explanations provided by peers easier to understand and therefore more accessible than from content experts.

Students tended to post questions anonymously, however reported a strong sense of community although not a true sense of collaboration. Students took from the interactions what they individually needed even if it was a different way of looking at content, or finding out how a lab report needed to be formatted while still maintaining a sense of “being in this together”. Social media allows for interactivity and content
creation although most students in this study participated primarily as observers.

Recommendations and suggestions for further study were provided.
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CHAPTER 1. INTRODUCTION

Introduction to the Problem

Web-based communication tools, collectively known as social media, have made online communication as well as the creation and sharing of multimodal content between individuals easier (McEwan, 2012). This is a study about how students voluntarily made use of a social media tool called Piazza in their study of biology. This introduction will provide background for why we need to consider new technologies, like Piazza, that may enhance student engagement and that may facilitate the creation of a community of practice in sciences classes.

In a 2012 report to U.S. President Obama, the President’s Council of Advisors on Science and Technology (PCAST) indicated a need for significant improvements in the training of professionals in the science, technology, engineering and math (STEM) fields (2012). According to the PCAST report, greater than 60 percent of STEM undergraduate majors abandon their initial choice of major and fail to complete a degree in a STEM area (2012). The council also reported that student dissatisfaction with large introductory classes was one of the top reasons reported for the change in majors and emphasized that the first two years of college were critical in student retention (President's Council of Advisors on Science and Technology (U.S.), 2012). PCAST strongly recommended the improvement of teaching methods in undergraduate classes and a renewed focus on the engagement of students though “active learning” teaching practices (2012). They went on to recommend the following:
Recommendations of the 2012 PCAST Report:

- Provide opportunities to maximize student engagement in the college and university classroom.
- Incorporate programming that is designed to build community.
- Support students with advising, mentoring and tutoring assistance.

Historically, in university science classes, content has been provided through faculty lectures. Many colleges and universities, however, now challenge this tradition with instruction that is more active, student-centered and collaborative (Brewer & Smith, 2011). Amongst these innovative approaches in teaching and learning, peer learning is used promote collaboration in college and university classes. Moore and Kearsley suggest that “…interlearner discussions are extremely valuable as a way of helping students to think out and test content that has been presented, whatever the means of presentation” (2012, p. 133).

Online discussion forums have been used historically to facilitate student communications, but these forums were text-based and did not accommodate the editing of content by other users (Garrison & Kanuka, 2004). The introduction of social media tools have allowed for user-created online content and dynamic online interactions, further facilitating student-to-student communication and collaborations (Duggan, Ellison, Lampe, & Madden, 2015). New technologies provide for greater interactivity and support active peer learning by allowing students to fine-tune their own understandings and to construct new knowledge (Bransford, Brown, & Cocking, 2000).

Today, many undergraduate science classes now employ social media tools for instructional purposes (Brewer & Smith, 2011; Kuldell, 2007; Schroeder & Greenbowe, 2009; Shee, Strong, Guido, Lue, Church, & Viel, 2010; Weisman, 2009) At Boston
University, there are several science classes experimenting with social media tools, including wikis, in the classroom. A wiki is an application that allows for free content creation and editing from multiple authors (Leuf & Cunningham, 2001). One such tool used for online discussions called Piazza, which works like a wiki in that it accommodates user-generated content including that of various media types (Piazza Quick Start Guide, 2013). In Spring term 2014, students in CAS BI 108, a large, face-to-face introductory biology class used Piazza to interact and share ideas online.

**Statement of the Problem**

The structure of college, introductory, biology classes is often large lecture classes with smaller laboratory sections. The PCAST report documented problems in student retention in STEM disciplines and further identified that students were unhappy with large introductory classes (2012). Understanding how social media might enhance student interactions and engagement could be important in improving student satisfaction, and retention in STEM classes. While some studies have measured student success rates in online science classes, few have specifically addressed the contribution of social media tools to help science students communicate with each other and to influence the creation of a learning community (Garman, 2012; Ghosh, 2011; Zhou, 2012). This study addresses this research gap by studying how students are using a social media tool called Piazza in their study of biology in a large, introductory face-to-face class. My goal was to learn how students used social media to collaborate online in a biology class and whether the interactivity influenced the creation of a community.
Wenger’s Community of Practice model (2015) served as the framework for this study to understand if a community of practice in the biology class was developing as through the use of Piazza. Wegner suggests that members of a community of practice share an interest in a common domain and expand their expertise by interacting with each other (2015). Social media provides opportunities for interactions and the opportunity to share ideas (Gunawardena, Hermans, Sanchez, Richmond, Bohley, & Tuttle, 2009). Prior to the introduction of interactive technologies, students gathered outside of classes to study together. Since the introduction of interactive technologies, students have embraced wikis, blogs, photo sharing sites and social networks in their personal lives (Bauerlein, 2011; Turkle, 2011). According to a 2010 report by Caraher and Braselman, more than 50 percent of college students independently use social media tools such as Facebook and Google Drive in their studies as well as in their social life. If we can understand how the students derived value from a social media tool such as Piazza, we may be able to more effectively enhance the learning experience for students in STEM disciplines.

**Significance**

It is important to understand if students derive value from using a social media tool such as Piazza to augment face-to-face instruction since it may have an impact on learning and ultimately retention in science classrooms. Through the study of how social media are being used in higher education, researchers have started exploring social learning models in online platforms and their influence on teaching and learning (McEwan, 2012; Johnson, Adams Becker, Cummins, Estrada, Freeman, & Ludgate, 2013; Joosten, 2012; Schroeder & Greenbowe, 2009). This study contributes evidence
regarding the use of social media tools in the classroom, and how they can enhance the student learning experience.

**Research Questions**

1. How are students using the social media tool Piazza in their study of biology?

2. What do students perceive as the value added of using Piazza in their study of biology?

3. How does Piazza affect the creation of a community?

**Organization of the Study**

In Chapter 2, the literature review, I examine student-to-student interactivity in science education, early static online discussion forums, and newer social media applications. Theories of social learning are examined as well as an exploration of the creation of online communities. Chapter 3 provides details of the research methodology including a detailed description of the research design, data gathering methods and analysis used for the study. Chapter 4 presents summary results of study data. Chapter 5 provides discussion of findings, conclusions and recommendations for further research.
CHAPTER 2. REVIEW OF THE LITERATURE

Introduction

Science educators now recognize the importance of student-to-student interaction in the classroom and are experimenting with social media tools to support communication and the development of a community of learning. This study examines how Piazza, a social media tool, can be used to support student-to-student interactions. This chapter reviews studies relating to student-to-student interactions in science education. Historically these interactions have been face-to-face and have inspired the development of several pedagogical approaches to enhance student interaction.

With advances in technology, classroom based interaction models were extended to virtual spaces and this review also explores student-to-student interactions in online and web-enhanced classes. This review further reports on the use of social media by traditionally aged college students as well as how social media is being used in educational applications. Further, as this study examines the effect of social media on the development of a community, the literature on the development of a community of practice is reviewed.

Student-to-Student Interactions

Historically, in traditional university science classes, students principally functioned as an audience and discussion only arose during science labs when students had greater opportunity to interact with peers (Goldman, 1992). The more informal environment of the class laboratory encouraged positive, cooperative student interactions...
These cooperative learning experiences in the science classroom laboratory were tied to improvements in student achievement and offered the students the chance to create a classroom community of scientists (Hofstein & Lunetta, 2003). Student-to-student interaction introduced them to “…disciplinary language, values, and ways of knowing” (Krajcik, Blumenfeld, Marx, & Soloway, 2000, p. 305).

The microconversation that goes on in peer-group work tends to model the conversations in which scientists construct knowledge, whether those conversations are direct (person to-person), displaced (into publication or interaction with computer programs), or internalized (as thought) (Bruffee, 1999, p. 178).

A summary report of a 2009 invitational conference sponsored by the National Science Foundation and the American Association for the Advancement of Science reported strong student and faculty interest in increasing opportunities for small group work, collaborations in ongoing research, and cooperative frameworks for students (Brewer & Smith, 2011). When a group share common goals, they will be more likely to encourage each other and assist other members to achieve (Springer, Stanne, & Donovan, 1999). Additionally, the non-competitive nature of these activities may improve the chances of women and underrepresented minorities to equally participate in a more collaborative and equitable process (Guiller & Durndell, 2007; Kim & Bonk, 2002). Springer, Stanne, & Donovan (1999) also reported that the way in which groups collectively process information facilitates cognitive growth and knowledge development.
Peers Learning

Peer learning is just one of several related educational approaches that require the combined intellectual effort of students (De Lisi & Golbeck, 1999; Smith & MacGregor, 1992; Topping, 2005). Peer learning is characterized by the grouping together of individuals who are not in an official teaching role, but learn by helping others in their group (Topping, 2005). Advocates of peer-to-peer learning believe that within a collaborative environment, each student contributes to the learning, such that the process produces knowledge that an individual would likely not have been able to construct independently (Futch, 2005).

Peer learning at all levels has increased due to the growing adoption of a constructivist approach that recognizes the importance of social interaction in learning (De Lisi & Golbeck, 1999). In addition, it has been reported that students value opportunities to connect with peers. Lockspeiser, O’Sullivan, Teherani and Muller studied the participation of second year medical students in a peer teaching program who worked with first year medical students (2008). The first year students valued the interaction with the upper level students not only for the cognitive gains, but also for the social interactions (Lockspeiser, O'Sullivan, Teherani, & Muller, 2008). Additionally, the second year students close in educational level or experience working with more novice students were shown to “…empathize with their students. Teach at the appropriate level and anticipate and reframe learning” (Lockspeiser, O'Sullivan, Teherani, & Muller, 2008, p. 370). The study also found that the near peer students found value in relearning material previously learned by teaching it to another.
Research by Webb (1982) supports the belief that the process of explaining can support learning. She studied student groups involved in peer learning, and while controlling for ability levels, reported that the best performing students were those that offered the explanations to the lowest performing students (Webb, 1982). Topping (2005) suggests that the most effective peer learning takes place when a student whose capabilities are closer to those of the student being helped. This provides intellectual challenges for all participants by avoiding boredom and providing opportunities to learn more deeply through the process of teaching to another student (Topping, 2005).

**Science Education**

Tanner (2009) suggested that all of the current popular science teaching strategies have student talk at the core from cooperative learning to peer-to-peer learning. It follows then that student talk may have an association with students learning science. In recent years, some science instructors have been using online forums as a mechanism to encourage peer collaboration and as a means of making learning visible both for the benefit of the student and for assessment purposes (Doering & Henrickson, 2012; Ghosh, 2011; Scogin, Ozturk, & Stuessy, 2013; Turcotte & Laferriere, 2004; Weisman, 2009). Smith, Wood, Adams, Wieman, Knight, Guild, and Su (2009) studied student interaction and discussion among peers in a genetics class, finding that students valued discussing questions and collectively coming to consensus about a correct answer through the process of discussion. Chi, De Leeuw, Chiu and La Vancher (1994) found that the students who were prompted to explain scientific content scored better on assessments than students who were not encouraged to explain their understandings. Hughes (2011)
investigated the role of near peer students in student success in a college level anatomy and physiology class found that those who participated in peer-to-peer discussions ended the class with a higher final course average.

**Technology In Education**

While most peer studies in science classes focused on traditional classroom formats, advances in technology have provided the opportunity for peer work in online course offerings and for web enhancements in science education. Learning management systems such as Blackboard present opportunities for asynchronous threaded discussion forums (Moore & Kearsley, 2012). One of the earliest modes of online communications was text-based discussion forums. Online discussion forums are electronic media that allow students to post thoughts and comments to be read and responded to by other students (Weisskirch & Milburn, 2003). Research by Resta and Laferriere suggests that students interacting through online discussion forums can lead to “development of higher order thinking skills, student satisfaction with the learning experience and improved productivity” (2007, p. 70). The process of prompting students to record their thought process allows for the creation of a transcript of the process making this available to the learner themselves for reflection, and to their peers (Bransford, Brown, & Cocking, 2000).

**Web 2.0**

Web-based programs facilitating the sharing of information have made online student interactions easier. Known collectively as Web 2.0 tools, these technologies are characterized by the capacity for people to virtually communicate, collaborate and
provide user generated content (O'Reilly, 2005). Social media is an expression used to refer to Web 2.0 technologies specifically associated with collaboration and user generated content (Joosten, 2012; McEwan, 2012). The interaction between students inherent in virtual discussions allows to students engage with new content (Moore & Kearsley, 2012). In a study looking at the role of online discussions in web-enhanced courses, Kumar (2007) found that online and classroom discussions in web-enhanced classes complemented each other and provided for benefits to both students and faculty. Among the benefits cited by students was the chance to interact with other students in addition to greater opportunity to reflect on the course readings and the perspectives of their peers (Kumar, 2007).

**Social Media**

Today’s traditionally aged undergraduate students are technologically savvy and there have been many studies documenting their use of the use of technology in their social lives (Brenner & Smith, 2013; Seaman & Tinti-Kane, 2013; Tess, 2013). According to the 2010 EDUCAUSE report, traditionally-aged university students (18-21) increasingly use Web 2.0 technologies for content creation and for sharing including video websites, wikis and social networks (Smith & Caruso, 2010). Web 2.0 interactive technologies inspired the creation of online communities of individuals participating in dynamic content creation and resulted in such social media sites such as Wikipedia, Facebook, and YouTube (Cheung, Chiu, & Lee, 2011; Faraj, Jarvenpaa, & Majchrzak, 2011). A recently published report by the Pew Research Center indicated that the use of multiple social media platforms has increased, with 52 percent of all online adults using
two or more social media sites such as Twitter, Instagram Pinterest, or LinkedIn (Duggan, Ellison, Lampe, & Madden, 2015).

What we can see in the Web's evolution is a new focus on innovation, creation, and collaboration, and an emphasis on collective knowledge over static information delivery, knowledge management over content management, and social interaction over isolated surfing. The jargon-laden stars of the second-generation Web — wikis, blogs, social networking, and so on — all encourage a more active, participatory role for users (Maloney, 2007, p. B26).

Facebook remains the most popular social media site and is used by 87 percent of American Internet users (Duggan, Ellison, Lampe, & Madden, 2015).

In examining the motivations of social media users, Fraser and Dutta identified five different categories of social networking sites: “egocentric, community-based, opportunistic, passion-centric and media sharing” (2008, p. 4). The egocentric social networks like Facebook serve to provide for “identify construction” (Fraser & Dutta, 2008, p. 4). Community-based networks are those that mirror deeply rooted communities that exist in the real world such as those based on race and religion. (Fraser & Dutta, 2008). Fraser and Dutta (2008) describe opportunistic networks as networks that provide members an advantage beyond social connections such as LinkedIn for career connections. Finally, passion-centric and media sharing networks are distinguished by the content available on the site, for example YouTube, Flickr (Fraser & Dutta, 2008). Fraser and Dutta (2008) segment the motivations behind membership in a social network into two general groups: rational and non-rational motivation. They suggest that individuals who are motivated to participate in social networks like LinkedIn are doing so in a strategic way to enhance their own professional networks and their career advancement.
On the other hand, the authors classify non-rational participation as those who join social networking groups in order to connect socially. This rather simplistic dichotomy is based on Ferdinand Tonnies 19th Century work on definitions of community (Gemeinschaft) that are based on common values and close bonds as compared with other groups that are rooted in self-interest and personal gains (Fraser & Dutta, 2008).

**Social Media in Education**

Students informally use social media in their studies outside of the classroom (Johnson, Adams Becker, Cummins, Estrada, Freeman, & Ludgate, 2013; Kumar, Liu, & Black, 2012). While social media tools were not expressly designed for educational purposes, their capacity for sharing content and facilitating communications between users has potential to transform communications and collaboration amongst students (Hsu, Ching, & Grabowski, 2014; Tess, 2013). The structural framework for user-generated content is provided for by social media sites (Krumm, Davies, & Narayanaswami, 2008). Through the use of social media we are starting to see a transformation in the way that students communicate and collaborate (Tess, 2013).

There are several research studies examining the use of social media tools in education. A 2010 study demonstrated that online social networking tools had a positive impact on the learning outcomes of university students, in addition to assisting students in becoming acclimated to the culture of the university (Yu, Tian, Vogel, & Kwok). Researchers from the University of Iowa studied how a closed Facebook group provided an alternate student discussion space outside of class (Schroeder & Greenbowe, 2009). The Facebook page allowed users to also post photos or also to provide links to
supplement text. The Facebook group received a great deal of participation from students with almost six times the number of posts on the Facebook page as compared with the learning management page on which course materials were uploaded (Schroeder & Greenbowe, 2009). Munshi (2014) found that students used social media tools in their studies using primarily Facebook to connect with peers when they had questions.

Deng and Yuen (2011) found that participation in blogs promoted student self-reflection and social interaction. Adventure learning teams make use of Web 2.0 communications tools so that groups of learners are able to interact and collaborate with the explorers in the field (Doering & Henrickson, 2012). At Harvard and MIT, wikis were integrated into the International Genetically Engineered Machines (iGEMS) in synthetic biology, a summer research education program for undergraduates. Prior to coming together for the summer, students used wikis for online communications, and open data sharing to facilitate communication and to advance the team projects (Shee, Strong, Guido, Lue, Church, & Viel, 2010). A study examining online communications between biology students and their online scientist mentors found that scientists influenced the development of the students’ scientific proficiencies and also provided motivation to the students to engage in the inquiry process as well as helping the students feel like valued participants (Scogin, Ozturk, & Stuessy, 2013).

Gomes and Sousa (2013) presented a case study of the use of wikis in an information systems class, and concluded that wikis contributed to the development of student group processes including better communication and organization skills. At University of Massachusetts, Weisman (2009) developed a web-based laboratory for a
face-to-face bioinformatics class. The basis for the laboratory was virtual student-to-student communication and collaboration. He found that students through their collaborations solved technical issues, integrated bioinformatics concepts with basic biological theories and “applied acquired knowledge in new contexts” (Weisman, 2009, p. 6).

A 2005 study by Caruso and Kvavik indicated that more than 50 percent of the students surveyed identified convenience as the main benefit of using technology in academics followed by communication, control and learning. Even though students were able to create unique content, Kumar et al., found that students used social media tools like blogs and wikis primarily as resources rather than as a means of creating content (2012). Collaborations in a virtual space are not without challenges. In Robinson’s (2013) study of the relationship of emotion and cognition related to collaborative online work, she found that students often felt frustrated with group work specifically because group members’ delayed participating and constrained the autonomy of project completion. Some participants felt that the online communication process was confusing and impeded efficient communication (Robinson, 2013). Despite limitations and challenges, social media allows students the opportunity to express their questions, see the viewpoints of their peers, and collectively inquire (Stahl, Koschmann, & Suthers, 2006).

At Boston University, physics professor, Andrew Duffy, Ph.D., has augmented his face-to-face physics classes with the social media tool, called Piazza and has found it valuable to inform his own teaching, alerting him to concepts that are widely misunderstood (Duffy, 2013). The enduring transcript of his responses to student
questions was available to all students, and reduced the number of similar questions sent
to him by individual emails (Duffy, 2013).

**Piazza**

Piazza is a Web 2.0 learning tool in that that blends the learning advantages
provided by more structured discussion forums with the flexibility of wikis (Hill, 2012).
Named after the Italian word for city square, a piazza is historically a place where people
come together informally to socialize and share ideas (Riley, 2010). Piazza allows for
instructor-student interaction as well as student-to-student interaction whereby students
can ask questions or post responses to the entire class or individual students or just the
faculty member (Piazza Quick Start Guide, 2013). Students can read, ask questions, or
respond to posts asynchronously outside of class time (Piazza Quick Start Guide, 2013).
Participants are alerted by way of a modifiable email notification system when a new post
has been added. Hill (2012) describes Piazza as a free, cloud-based, learning tool.

Piazza allows faculty the opportunity to upload class files including images and
videos, supplemental readings or syllabi without file size limitations (Piazza Quick Start
Guide, 2013). Although some faculty members load class materials onto Piazza so that all
course related documents are in one place, it was not designed to replace the learning
management system. Faculty can also link the Piazza class page to an existing class
management site such as Blackboard so that there is a single point of entry for class
participants (Piazza Quick Start Guide, 2013). Piazza also has developed smartphone
applications and offer them free to faculty and students for use in connecting on the go or
for use in real-time assessment activities and are used in some cases as a replacement for
clickers (Piazza Quick Start Guide, 2013). Faculty can post announcements that do not require student response such as a change in the assignment due date or any change in schedules.

Piazza is organized with two panes within a larger window (see Figure 2.1) the smaller sidebar lists discussion topics and the larger areas details exchanges related to a specific question (Wong, 2012).

Figure 2.1 Piazza Dual Pane Window

Social Media And Communities Of Practice

Social media tools facilitate communication and interactions between students and therefore it is a natural extension to consider the social constructionist theory to help to provide a framework of how online learning communities are formed and how virtual interactions may influence learning within a community.

An advantage of online technologies for communication is that they provide a vehicle to make learning visible (Bransford, Brown, & Cocking, 2000). The preservation of a transcript as documentation is helpful to students for reflection, and also to
instructors for assessment (Branford, Brown, & Cocking, 2000). It has been found that providing distance education students’ interaction opportunities whether with the instructor, peers or content led to improved student learning outcomes (Bernard, et al., 2009). Further in science with its unique cultural characteristics, participation in discussion further attunes the participants in the unique ways of knowing (Matthews M. R., 1994).

Consideration of what understandings that the student is bringing to a discussion is considered helpful. Prior student content knowledge is recognized as an important factor in influencing the quality of student contributions (Resta & Laferriere, 2007). “One of the earliest studies of expertise demonstrated that the same stimulus is perceived and understood differently depending on the knowledge that a person brings to the situation” (Bransford, Brown, & Cocking, 2000, p. 32). Content experts such as instructors and scientists tend to organize their ideas around core concepts while typically novice students do not (Bransford, Brown, & Cocking, 2000).

Science as a discipline has its own philosophy, language and culture which become part of the learning process (Matthews M. R., 1994). Science instructors who teach online often use tried and true classroom techniques such as prompt feedback, student engagement and interaction however even the best classroom practices encounter new challenges in virtual environments (Kenneppohl, 2012). There is evidence that the study of science online would benefit from the careful establishment of a community of scientific practice, building on the concept that knowledge and understanding are socially constructed through discussion and interaction (Bransford, Brown, & Cocking, 2000).
Science curricula need to be scrutinized through the lens of scientific frameworks and contexts (Bransford, Brown, & Cocking, 2000). Science education in a virtual space requires a tool kit unique to the discipline. “If properly prepared, science students can learn from a well-designed online asynchronous discussion alone” (Hoadley C. J., 2000, p. 855). Tanner (2009) outlined several reasons that instructors provide as why they value student discussion or as she describes it “student talk” including transformation of the large science lecture class to resemble discussion sections and promoting meta-cognition by encouraging students to actively think about what they understand. The most important outcome may be the promotion of a collaborative culture unlike the competitive environment often found in undergraduate science classes (Tanner, 2009). In a research study by Ghosh (2011) on the academic success of community college students in online science classes, students expressed the greatest satisfaction from idea exchanges and perspectives from their peers. These same students expressed frustration and negativity because the instructional design did not accommodate the easy exchange of ideas between peers (Ghosh, 2011). It has been found that providing distance education students’ interaction opportunities with instructors, peers or content led to improved student learning outcome (Bernard, et al., A meta-analysis of three types of interaction treatments in distance education, 2009).

**Social and Cultural Considerations**

Online conversations may prove to be advantageous for many reasons. In online interaction, the lack of nonverbal cues can sometimes present a disadvantage since nuances such as tone of voice and gestures are missing, participants need to make
assumptions about other participants (Hara, Bonk, & Angeli, 2000). Gender and cultural issues may impact the experience of the online discussion forum and deserve the attention of course designers and instructors. Guiller and Durndell (2007) found that females were more agreeable and supportive in online communications than were males and that males tended to use authoritative language and their posts tended to be more negative. Research conducted by Kim and Bonk (2002) suggested that students from different cultures view the concepts of collaboration differently. Further not everyone who is reading the responses is actually responding to them so while an individual may be learning while being a silent reader or “lurker”, the other participants do not have the advantage of reading that persons viewpoint or arguments.

**Participation Concerns**

An interesting aspect of the use of social media tools in education is that typically unless incentivized, a small fraction of those who are able to actively participate actually do so. Sometimes, unless students are specifically required to post, many students will simply read what other students have posted (Preece, Nonnecke, & Andrews, 2004). This type of behavior is also known in the literature as “lurking” (Beaudoin, 2002; Dennen, 2008). “In a class context, lurking tends to be restricted to known members and acts of lurking may be interspersed with acts of participation” (Dennen, 2008, p. 1625). Lurking has taken on a negative connotation in the literature as those who do not want to contribute to the larger community (Beaudoin, 2002; Dennen, 2008; Preece, Nonnecke, & Andrews, 2004).
Helmut Fritsch developed the concept of witness learning referring to students who are engaged through reading of online content but who decline to post comments themselves (Fritsch, 1997). Fritsch (1997) maintains that although there is not documentation of learning for these individual in, that learning for these individuals may still be taking place. We know that in face-to-face class environments not all students participate equally and some may not participate in class discussion at all. “We tend to under-emphasize the fact that two kinds of knowledge creation take place in any shared learning experience, the ‘individual’ and the ‘social” (Gunawardena, Lowe, & Anderson, 1997, p. 409).

The literature is somewhat conflicted as to if lurking is a form of learning. Rovai (2002) suggested that lack of visible participation in the class community could lead to feelings of low self-esteem and ultimately increased dropout rates. Some have suggested that we do not fully understand what is happening when students lurk online and that we should not necessarily assume that no learning is taking place (Arnold & Paulus, 2010; Beaudoin, 2002; Dennen, 2008).

**Social Learning**

Many of the benefits ascribed to peer-to-peer interactions have their roots in social learning theory. Bandura’s social learning theory suggests that new information can be acquired through observing the actions of others (Bandura, 1977). He further developed this theory into the social cognitive theory which suggested that people are active rather than passive participants in their learning and there is an interactive relationship between the person, the behavior and the environment (Bandura, 1986;
Wood & Bandura, 1989). An important component of the social cognitive theory is an individual’s self-efficacy which is a function of an individual’s confidence in their own abilities to attain certain goals (Wood & Bandura, 1989). Success therefore is dually dependent on an individual’s skills and their belief in one’s own capabilities (Wood & Bandura, 1989). Enhancing self-efficacy is related to better self-regulation with applications in multiple social arenas (Bandura, 2004). Motivation is also influenced by one’s sense of self-efficacy and further relates to self-regulation (Wood & Bandura, 1989).

From a learning perspective, autonomy is the basis of self-regulation as the individual controls their actions towards attainment of academic goals through time management, organizing, and effective use of social resources (Schunk & Zimmerman, 1997). Self-regulation relates to the extent that students are “metacognitively, motivationally, and behaviorally active participants in their own learning process” (Zimmerman, 1989, p. 4).

Research regarding collaborative learning within computer mediated environments has received much attention within recent years (Buraphadya, 2010; Faraj, Jarvenpaa, & Majchrzak, 2011; Gress, Fior, Hadwin, & Winne, 2010; Hull & Saxon, 2009; Kumar, 2007). La Pointe (2005) suggested that students learn more easily through interaction with their peers through computer mediated communications and that such communications were strongly related to learner satisfaction. Situated learning provides for learning by participating with other participants (Hung D., 2002). Situated learning frames learning in a social context through social interactions (Hung & Yuen, 2010). Web 2.0 technologies allow groups to develop along common interests and facilitate interaction and cooperation (Richardson, 2010). Using tools can change ways of thinking.
about a problem and can transform “not only the task but human capabilities” (Joinson, 2003, pp. 2-3).

Community of Practice

Wegner defines a community of practice as “groups of people who share a concern, a set of problems or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (Wenger, McDermott, & Snyder, 2002, p. 4). These might be groups in which we regularly or even occasionally interact at work, school or socially (Wenger, McDermott, & Snyder, 2002). Hoadley offers that a community of practice is a “theoretical construct that underlies a particular model of learning, namely learning in which people, through a process of legitimate peripheral participation, take up membership in and identity with a community which serves as the home of these shared practices” (Hoadley C., 2012, p. 297). Wenger (2015) suggests that three elements are essential for a community of practice: domain, community, and the practice.

Members of the community of practice are interested in a common domain and imply a shared competence that distinguishes members of this community from others. (Wenger E., 2015). Social media provide forums for participant interaction and the opportunity to share ideas, and develop shared understandings (Gunawardena, Hermans, Sanchez, Richmond, Bohley, & Tuttle, 2009). Members of this community engage in common activities, share information and offer advice to each other. (Wenger E., 2015).

Gunawardena, Hermans, Sanchez, Richmond, Bohley, Tuttle (2009), propose that the social constructionist theory can be used to study how communities are formed
through Web 2.0 technologies. “Social networking tools like wikis and blogs can help to build community through dialogue and conversation, selectively making sense of past and present experiences” (Gunawardena, Hermans, Sanchez, Richmond, Bohley, & Tuttle, 2009, p. 4).

In practice, members of this community participate in the domain such that they are practitioners that share common practices, experiences and ways of thinking. (Wenger E., 2015). Gunawardena et al. suggest that when member of a community are using Web 2.0 tools for communicating, that a shift in cultural norms may be taking place such that the tools may be causing a change in the way that participants are thinking and their ways of approaching the task related to the practice (Gunawardena, Hermans, Sanchez, Richmond, Bohley, & Tuttle, 2009). ”Therefore, the social networking tools we use will change how we think, how we learn and how we interact with each other” (Gunawardena, Hermans, Sanchez, Richmond, Bohley, & Tuttle, 2009, p. 4). Communities of practice can be supported by technology in providing a means of connecting individuals with the common interests and a means to access to the posts of the collective community (Hoadley C., 2012)

Relevance

Instructors are integrating more web-enhancements into face-to-face classes and it is important to understand the contributions that these technologies can provide. Using three main data sources, a survey, interviews and actual site data and metadata, this study attempts to understand how students are using the Piazza site in their study of biology and which aspects do they find most valuable. This study also endeavors to understand if
Piazza helps to contribute to a community of practice in the study of biology. Chapter III provides details regarding the research design and data collection methods.
CHAPTER 3. RESEARCH DESIGN AND METHODOLOGY

Introduction

The research methodology undertaken in this study was developed to address three research questions.

1. How are students using the social media tool Piazza in their study of biology?
2. What do students perceive as the value added of using Piazza in their study of biology?
3. How does Piazza affect the creation of a community?

Biology 108 in the College of Arts and Sciences at Boston University is taught in the spring term of each academic year. Biology 107 precedes it in Fall semester. As a result of high school advanced placement credit, some students are able to enroll in BI 108 without ever completed BI 107. Both classes are taught in a traditional face-to-face format with a required, traditional hands-on laboratory. The entire course is managed by a course director. In spring of 2014, two professors, who are content experts, each taught half of the course. In spring of 2014, cellular biology was taught at the beginning of the term followed by neuroscience after the spring break. In addition, the course instructors were assisted by graduate teaching fellows who taught the laboratory sections. Undergraduate learning assistants attended all classes and took notes, which were made available to the students. In addition, they also held optional discussion sections for enrolled students. The course was also augmented by an online social media site, Piazza (Piazza Quick Start Guide, 2013) that functions in practical terms like a wiki where students can collaborate online asynchronously.
Piazza provides an asynchronous online mechanism for students to collaborate and help each other with questions on different topics and of varying levels of difficulty. Students have the option to choose if they post a question for the entire community or only for the instructor(s). The instructor(s) for this class assumed a hands-off approach to questions posted for the wider class community and, for the most part, simply monitored the interaction between the students, ready to step in if there is a question that had not been answered or if a question had been incorrectly answered.

Participants

The students (600+) were enrolled in Boston University College of Arts and Sciences, BI 108 (Spring 2014). This large enrollment class was divided into three sections of lecture and numerous sections of required laboratories. In addition to freshman students, some upperclassmen that were enrolled were completing science requirements. Enrollment was not limited to students in the College of Arts and Sciences and included students from other schools within Boston University. At the time of the study, there were 592 students enrolled on the Piazza site. I received permission (Appendix I) from the CAS BI 108 course director Professor Spilios to conduct research in the class.

This study was undertaken to better understand the participants’ perceptions of Piazza’s value in a face-to-face biology class. The study uses a non-experimental design examining student responses to an electronic survey, responses to interview questions, and analysis of metadata provided by the Piazza site for triangulation of data.
Electronic Survey

I began collecting data from BI 108 students in Spring Term 2014, starting with an online survey (Appendix II) through the Qualtrics Research Suite (2014) in mid-March, 2014. The survey was tested for validity and reliability with a small test population from BI 107, a fall 2013 semester course.

In the spring of 2014, a request for student participation was posted on the BI 108 Piazza class site to alert students that they would receive an email from me regarding their usage of Piazza. The content instructor at that time agreed to include a single PowerPoint slide along with his lecture materials that contained a request for student participants. He agreed to announce the survey on one day only at the beginning of class at each of the three class sections on that day.

Student email messages were set up to be automatically delivered late in the afternoon of the same day of the in-class announcement through the Qualtrics Research Suite. Qualtrics is an online survey program that allows for online data collection (Qualtrics Research Suite, 2014). Each participant was sent a unique link that allowed them to enter the online survey. All participants were provided with an informed consent form describing the study and confirming the confidential nature of their participation. Data was only collected from participants over the age of 18 years so parental permission was not required. No personally identifiable data was collected and therefore anonymity was maintained.

The survey collected data about the students’ experiences with technology and specifically their use of Piazza within the context of CAS BI 108. The survey was
modeled after the survey used by Kumar, Liu and Black (2012) who granted me permission to use their study. The survey also collected demographic data in order to learn more about the users of the technologies such as their class year, major, ages, gender, expected grade and first language.

After the initial request for survey participants, two follow-up requests for participants were sent. A $5.00 Amazon gift card was electronically sent to students after completing the survey. The survey was live for a total of ten days. The survey was closed on March 30 after ten days resulting in a total of 306 surveys started and 292 surveys were completed.

The survey was designed to anonymize the data and all data is stored in a password protected electronic format. It took approximately 12 minutes for the participants to complete the surveys. The data collected was both quantitative and qualitative. The researcher downloaded collected data from the Qualtrics site into an Excel spreadsheet. Of those who started the survey, 96% were between 18-20 years old and 4% were between 21-22 years old. In order to identify those students who used Piazza within BI 108, a survey question to determine the percentage Piazza users was asked. When the respondents data was filtered in this way it revealed that 89% of all those responding to the survey were Piazza users.

Of the participants who answered yes to using Piazza, 254 or 97% were between the ages of 18-20 years old. Females constituted 73% of those students who reported using Piazza while male represented by 27% of those participating in Piazza. The gender distribution amongst Piazza users is consistent with the gender distribution of the class
overall which was 71% female and 29% male based on an in-class survey conducted at the start of the term. More than 90% of the participants indicated a biological science or other STEM major. As shown in Table 3.1, greater than 79% of the participants were college freshmen and more than half of the freshman respondents were female.

Table 3.1 Gender Distribution by Class Year

<table>
<thead>
<tr>
<th></th>
<th>Total By Year</th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>79%</td>
<td>56%</td>
<td>23%</td>
</tr>
<tr>
<td>Sophomore</td>
<td>16%</td>
<td>15%</td>
<td>1%</td>
</tr>
<tr>
<td>Junior</td>
<td>4%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Senior</td>
<td>0.4%</td>
<td>0%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Graduate Student</td>
<td>0.4%</td>
<td>0%</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

As shown in Table 3.2, English was the first language of most of the participants followed by Spanish and Chinese.

Table 3.2 First Language of Participants

<table>
<thead>
<tr>
<th>Language</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>82%</td>
</tr>
<tr>
<td>Chinese</td>
<td>3%</td>
</tr>
<tr>
<td>Spanish</td>
<td>5%</td>
</tr>
<tr>
<td>Other</td>
<td>10%</td>
</tr>
</tbody>
</table>

Descriptive statistics about student use of technology, their use of Piazza in particular and the value that they perceived in using Piazza were gathered in addition to narrative responses that the students provided and are reported in Chapter 4.

Interview Participants

At the conclusion of the electronic survey, the final screen provided an opportunity for students to indicate if they wanted to receive an Amazon gift card as a
thank you gift for participating in the survey. Fewer than 4% of the respondents declined the gift card. The final survey screen also included a request for interview participants. A total of 124 participants or less than 43% agreed to a follow-up interview. Using metadata from the Piazza website I was able to determine how frequently individual students were on the class-site as well the total number of contributions (posts or responses) from each student. I cross-referenced the list of volunteers with the Piazza class report that indicated the frequency of Piazza use and highlighted those participants who were either frequent users or moderate users of Piazza. Since I was interested in how students were using Piazza in support of their studies, I was interested in interviewing those who had the most experience with working with Piazza as they would be the best informed about the benefits and the drawbacks of Piazza use.

From the group of student Piazza users who had agreed to interviews, I sent email requests of interviews to ten volunteers who were the most frequent users of Piazza and subsequent to those interviews sent emails to the next set of ten student volunteers until I had extended a total of 31 invitations to student volunteers. The student interview guide is located Appendix III. All subjects interviewed were given an informed consent form. All subjects were assigned a study ID and were anonymous and unidentifiable. After conducting 27 open-ended student interviews, it was apparent from the student responses that no new important information was being collected and I concluded that I had reached data saturation. In addition, I interviewed three instructors. The instructor interview guide is located in Appendix IV. All subjects interviewed were given a $10 Amazon.com gift card for their participation.
Interviews were recorded on an iPod touch device and these files were downloaded to my password protected desktop computer. I transcribed the interviews and used Nvivo qualitative software to assist with the coding process.

**Metadata and Analysis of Posts**

I collected usage statistics from the Piazza class website and examined usage patterns as well as numbers of unique users per day, and number of postings per day at selected periods within the semester. From the Piazza class website I could determine the total number of posts, the total contributions that included responses to posts, and was able to distinguish between responses from students and responses from instructors. The average response time was also available on the Piazza site. Piazza also provides the number of days that a student was on the site as well as the number of contributions posted by the individual student.

I reviewed each Piazza post and coded it as either an administrative or a content related post because I wanted to better understand the purposes for which students were using Piazza in BI 108. Were students using the site to understand conceptual information such as the steps in the Krebs cycle or were they using it for administrative details such as the format of lab reports?

**Summary**

I analyzed survey data, interview responses, actual use metadata and postings from the Piazza site, to offer insights regarding if and how students used Piazza in BI 108, and whether they are using any other social media in their study of biology. The
survey responses and the interviews will lead to a better understanding of the role of Piazza in the development or support of a CAS BI 108 learning community.
CHAPTER 4. DATA ANALYSIS AND RESULTS

Introduction

Chapter 4 contains findings which are divided into six sections.

1. The first section establishes student experience with technology, social media and online content creation.

2. The second section establishes the preferred resources used by students in their study of biology. This question was asked to establish how the use of Piazza related to other study resources available to biology students.

3. Research Question 1-How Students Are Using Piazza In Their Study Of Biology?

4. Research Question 2- What Do Students Perceive As the Value Added of Using Piazza in their Study of Biology?

5. Research Question 3-To What Extent Does Participation in Piazza Contribute to the Student’s Perception of Involvement in a Class Community?

6. The last section examines the motivations related to the student use of Piazza.

Experience with Technology

Students were asked about their use of electronic devices to understand what type of hardware the students were using frequently. This might suggest a certain level of experience and skill with technology. Students could select more than one device so long as they used it on a daily basis. As reflected in Table 4.1, the majority of students (242) had smartphones and laptop computers which they used every day. Six students used desktop computers while 47 reported using a tablet every day.
Table 4.1 Type of Hardware Students Use Daily

<table>
<thead>
<tr>
<th></th>
<th>Smartphone</th>
<th>Desktop Computer</th>
<th>Laptop Computer</th>
<th>Tablet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Students</td>
<td>242</td>
<td>6</td>
<td>258</td>
<td>47</td>
</tr>
<tr>
<td>n=261</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Experience with Social Media

I asked questions about social media use to establish a level of skill and comfort with social media for social purposes. The literature suggests that ease of use of social media helps to foster the creation of online communities of individuals participating in content creation (Krumm, Davies, & Narayanaswami, 2008). As shown in Figure 4.1, 95% of the students had Facebook accounts, while 55% reported having a Twitter account and 41% used Google+. More than 61% of students indicated that they used YouTube and 32.6% reported using other forms of social media.

Figure 4.1 Student Social Media Experience n=261
As shown in Figure 4.2, 94% of the students reported using Facebook more than once a week. While 71% indicated that they were daily Facebook users. Ninety percent of students reported that they used YouTube at least once a week or more and 32% reported using YouTube every day. Students were able to select as many forms of social media that applied.

**Figure 4.2 Frequency of Social Media Use for Non-academic Purposes n=261**

![Bar chart showing frequency of social media use](image)

**Experience With Online Content Creation**

To further discern student comfort with technology and with the creation of content online, the students were asked if they had created a website, a blog, a wiki, a podcast, a discussion post, or an electronic portfolio. As shown in Figure 4.3, greater than 69% reported that they had created an electronic portfolio and 63% reported having experience creating a discussion post. Electronic portfolios are used in many classes at
Boston University, especially in the School of General Studies. In addition, students are required to post on discussion boards either on Blackboard or elected to post on Piazza.

**Figure 4.3 Experience Creating Online Content n=261**

![Bar chart showing social technology usage]

**Social Technology With An Educational Focus**

Students were asked to report on how they were using the different social technological elements in their studies. As shown in Figure 4.4, students reported texting more frequently (86%) than they reported using other forms of social communication technology although the use of Facebook was about equal at 84%.
In the interviews, it came to light that while many students used Facebook groups for academic purposes either in an instructor created group or through assembling their own groups, a large percentage of students were using mobile phone texting to connect academically with fellow students. Seventy-four percent of students reported that they had used Google Drive/Google Docs to connect with other students or to collaborate in a school project.

Survey participants and students interviewed reported the following:

**Texting:**

Greater than 85% of students indicated that they used texting in academics. Survey respondents and students interviewed reported using texting in an educational context to primarily organize study groups and meeting locations.

Survey respondent 19: Texting was also used to organize locations and times to meet and discuss various problems. The other interactive technology was used to
organize projects.

Survey respondents 24: Facebook and texting were used for communication within the group, to agree on ideas, meeting times, etc.

Survey Participant 66: Texting isn't as useful, especially in groups because it's usually just a few of the group members talking. If it's just one-on-one or maybe three, then it's more helpful. I use texting mostly for simple questions, not anything major.

Dena: Other than texting my friends, and making appointments to meet up on certain times or days of the week, we didn’t use Google docs or anything like that.

Dallas: Probably to like message someone to ask them a question, a quick question or something like that, yeah I’ve done that, sent emails with lab information and stuff like that on Google…

Facebook:

Greater than 83% of survey participants said that they used Facebook in their academics. The survey participants and those who were interviewed indicated that that they used Facebook for short bursts of communications with classmates in Biology but some were members of academic groups in other disciplines on Facebook and their participation was more substantial.

Survey Participant 32: I used Facebook and texting to discuss details for projects with classmates and to coordinate the responsibilities of assignments.

Survey Participant 12: Mostly Facebook (is used); we used group chats to communicate amongst each other, as it allowed us to attach current findings and chat live, mostly like talking on a phone.

Survey Participant 25: Facebook and texting were used for communication within the group, to agree on ideas, meeting times, etc.

Survey Participant 88: Facebook was used as a discussion board post. A group was created with all the students in the class and we were required to comment on literature and respond to other student's comments. I thought this was beneficial.
Survey Participant 92: Facebook and texting were used to collaborate meet-up times for me and my study groups or project partners. They were beneficial because I could contact them quickly and easily to set up a time and place to meet.

Survey Participant 66: Facebook groups are helpful for small discussion sections. Almost everyone has a Facebook and it's an easy way for everyone to consolidate work, get in touch, etc. I find them useful.

Survey Participant 209: Facebook: We used it to post questions and problems that we'd face upon completing the homework. I found this pretty helpful.

Survey Participant 66: Facebook groups are helpful for small discussion sections. Almost everyone has a Facebook and it's an easy way for everyone to consolidate work, get in touch, etc. I find them useful.

Survey Respondent 7: I use Facebook and texting to arrange study times with friends and use Google docs to save my documents.

Similar results were gathered through interviews. Students reported using text messaging and Facebook messaging for short information checks or to set up face-to-face meetings. Some students who did use Facebook for a science class expressed dissatisfaction with using it.

Dylan: I’ll use Facebook to kind of set up where we’re going to meet and when, but that’s probably the extent of it. I actually have not used any Facebook groups for my homework or help.

Penny: I do use Facebook (for academic), but it is more like” did you do to this problem… Do you want to meet up in person”, the more like for making plans then for actually asking questions. Sometimes I asked question (on Facebook) but is much easier to make plans to meet.

Diana: Yes, I use Facebook, just (with) lab partners we have group messages, different assignments, just kind of help with homework.

Carmen: For Biology I don’t (use Facebook). I’m really not friends with any people from my biology classes, but I am in my other classes, so we’re on Facebook/texting/group messages. Google docs, we’ll update our notes in one collective document. But not for biology, as I’m not already friends with people in that class. I don’t usually make friends in classes. So if I did know people, I
probably would use social media with them, but I don’t study with people for biology right now anyways.

Kerry: I’m in a Facebook group for Chemistry. I don’t really use the Facebook group that much because, I don’t know, I feel that there aren’t as many questions that people ask so it’s not as useful a tool.

Chloe: I’m not that involved in Facebook, but I don’t know that much. I’m not even in the chemistry group. I don’t want to get myself involved in a cult of study culture because I tend to do better in my own pace of learning, rather than everyone panicking because it makes me panic and I’m like ‘I have no time for this!’ and it’s like ‘no’.

Google Drive/Google Docs:

When students were asked how they employed various technologies in an educational context, students 73% cited collaboration technologies such as Google drive/Google docs for asynchronous, contributions to a single document. Most students had a positive experience using a Google Drive/Docs but primarily for courses outside of science.

Survey Participant 98: Use of Google Doc to communicate instead of meeting in person, everyone could go on and add their materials when it was convenient for them since the meeting times could not accommodate everyone.

Survey Participant 113: Using Google Doc allows us all to go on at the same time and fix each other’s mistakes and add our own comments.

Survey Participant 108: Collaborative technology such at Google docs and Skype make doing group projects easy. It allows work to be accomplished together, without members being in the same location.

Survey Participant 103: Google Drive is extremely helpful because it allows team members to share info and edit work in real-time without sending a ton of emails back and forth with each new idea/addition.

Penny: Yeah, actually I just use Google Docs yesterday for academic purposes. One of my friends needed a peer edit on her paper, and she didn’t have a lot of time, so I peer edited it on Google docs while she edited her own document with the edits that she had already intended to make. We were doing this at the same
time, so that was nice. I definitely do that a lot, I used to do that would biology notes in high school, we both take notes on the same Google document so that we could see what we had each determined as the most important thing in the chapter. And that was nice because we each got a different view of what one more important in each section of the chapter, so we each ended up with more thorough notes then we would have if we were working independently. Over spring break, we Skyped and worked on our packets together for chemistry because we had a lab report and we were actually doing the calculations, and we were thinking this is really weird, so we Skype and use Google Docs so that we can see the other person’s data, and worked well.

Talia: Oh yes, so for CGS we have a capstone project which is a huge you know dissertation kind that we present to our teachers at the end, we’re actually working on it now, and so for that we use Google Docs it’s very, very helpful, ‘cause you know you have, we have 7 people to a group and we all have different parts of this, it’s a 50-page paper, we all have different parts of the paper so you kind of post on there and everyone can edit each other’s stuff so Google Docs is very helpful.

Sarah: We use Google Docs so much just because it’ a way that we can collaborate all our efforts. We’ll often have, almost every semester I’ve had a team project of some sort so you have to turn in a team paper, do a team presentation, something like that where you have to collaborate with more than one to two people; It’s usually groups of five to seven people so it’s just these social media type things are a lot easier for us to coordinate because half the time it’s not something you have to make a new account for, almost everyone has a Facebook, almost everyone at BU at least has a Google BU Gmail account. So its things that you’re already there and it’s just making better use of it. And then with things like Google Docs you can all be editing one document at the exact same time.

**Video Technology:**

Slightly less than 32% used online videos to search for better explanations of content when they had questions regarding the curriculum.

Survey Participant 170: I use online videos as extra resources to improve on topics discussed in class and interactive technology to do that as well.

Survey Participant 195: I have used YouTube Videos to help study for tests. For example, there is a crash course channel with Hank Green which explains things like photosynthesis.
Survey Participant 15: I would look up videos on YouTube all the time to solidify information for Biology and Chemistry.

Other social media technologies that students reported using include Snapchat, Twitter, and Instagram. More than half of the students within the sample reported that they had used discussion forums other than Piazza in their academic coursework (Table 4.2). Prior experience in using online discussions and experience with using social media in an educational context might influence use of newer technologies,

Table 4.2 Experience in Using Discussion Forums Other Than Piazza in Academics

<table>
<thead>
<tr>
<th></th>
<th>Number of Responses</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>153</td>
<td>59%</td>
</tr>
<tr>
<td>No</td>
<td>108</td>
<td>41%</td>
</tr>
<tr>
<td>Total</td>
<td>261</td>
<td>100%</td>
</tr>
</tbody>
</table>

Communication Based Resources to Support the Study of Biology

I also wanted to understand how using Piazza as a resource compared with the other resources that were available to students. Survey participants selected faculty lectures as the most important communication resource supporting their study of biology. As noted in Table 4.3, in rank order students valued the faculty lectures most highly, with assistance from student-to-student tutors and help from laboratory teaching fellows about equally ranked in the survey. This was followed by participation in face-to-face study groups and participation in Piazza.
Table 4.3 Value of Communication Resources in the Study of Biology

<table>
<thead>
<tr>
<th></th>
<th>Extremely or Very Important</th>
<th>Neither Important or Unimportant</th>
<th>Very Unimportant or not at all important</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor lectures</td>
<td>223</td>
<td>26</td>
<td>12</td>
<td>261</td>
</tr>
<tr>
<td>Instructor office hours</td>
<td>73</td>
<td>122</td>
<td>66</td>
<td>261</td>
</tr>
<tr>
<td>Help from teaching fellows</td>
<td>160</td>
<td>73</td>
<td>28</td>
<td>261</td>
</tr>
<tr>
<td>Help from student assistants</td>
<td>162</td>
<td>66</td>
<td>32</td>
<td>260</td>
</tr>
<tr>
<td>Using Piazza</td>
<td>139</td>
<td>85</td>
<td>37</td>
<td>261</td>
</tr>
<tr>
<td>Face-to-face study groups</td>
<td>149</td>
<td>71</td>
<td>41</td>
<td>261</td>
</tr>
</tbody>
</table>

Interview participants stress similar value on the importance of faculty lectures and help from student-to-student tutors. Like the findings in table 4.3, they were not frequent participants in faculty office hours,

**Office Hours:**

Dylan: I actually have not been to a single Biology office hour.

Neva: No almost never (go to office hours) for biology. For the most part, I don’t feel like I need to, I feel like I can understand things on my own.

Instructor W- No kidding, every single one of us can count the number of students that we had (come to office hours) during their lecture time on one hand. Which is stunning considering there are 600 students in the class.

Claire: I mean yeah, they definitely have office hours and students do go, I've seen a couple students go after class its just that I personally don’t feel that the teachers are very accepting. I don’t know, it’s just my opinion because they aren’t saying ‘oh, you can come to me for help any time’ and they aren’t putting themselves out there and answering the questions in Piazza so in my mind I don’t really want to ask them just because I don’t feel like they want to answer; I’d rather have a more enthusiastic person answering.
Paul: I don’t usually go to the Bio office hours; I find it more helpful to talk to my friends. I believe I’ve gone to one of the LA (Learning assistant) discussion groups but I don’t know, I’ve never really seen them as necessary.

Abby: I actually meant to go to office hours but I couldn’t make it because of another conflict. I have not been to the student to student review session because I thought that maybe the reading the textbook would be more effective for me to get the whole information because I have friends who went and they were, like, if you haven’t read that much of the textbook, you should not go to the student study section. So I just read the textbook.

Instructor B: Nobody comes to office hours. I had more this year than I ever had. And I probably had a total of 10 visits. I said that these are my official office hours, but I am flexible to make appointments to accommodate your schedules. My door is usually open. A couple of people emailed me to make alternate office hour arrangements. There was actually, much more interaction though Piazza than there were people coming to office hours.

As indicated in Table 4.3, more than half of the students found face-to-face study groups of value. Some students organized their own face-to-face study groups. Some did this through Piazza while others met with friends whom they knew in the class or who also lived in their residence.

**Study Groups:**

Instructor B: I (saw a) couple of (Piazza) posts at one point looking to start students study groups, so that was good.

Dylan: Oh yes ma’am I have several groups in bio that I like to get together in study groups with before a test.

Edward: No, I never really found study groups helpful to me, not in college or back in high school. But I have a few people who live on my dorm floor and we’ll talk about it for a little while but we never really study together I just prefer to be by myself in my room and study.

Katia: Yeah, we would study together. There was one girl from my lab and then the two girls from my team and we studied together a couple times.

Kerry: Yeah, and study like the weekend before together. Kerry: It’s only four people but it helps because by yourself sometimes you get stuck.
Paul: Yup, we might look at it a few nights before, going up to the night before the exam. We try to do as much as we can as early as possible. Paul: It varies, I think the most we’ve had is six or seven but usually it’s been around three or four at the most.

Dena: For me, I would study on my own, and then if there were things that I wasn’t getting. I would meet up with friends and have a study group like that.

Erin: So we just had a test a couple days ago. The way I would study is a week prior, or maybe a week and a half prior, I would meet up with some friends and we would just go through the PowerPoints. We go through the PowerPoints and make sure we see everything that’s on there, that we've already discussed, just to make sure it’s fresh in our memory, go through our notes. And then the week before the test we would meet up and literally just read the book and take notes out of the book.

Some students reported working in face-to-face study groups and turning to Piazza when the collective members of the group came to an impasse.

Dena: In the study group, if we were not getting something, we would go on Piazza and look for the same question that we needed to ask. If the question was not up there, we would post the question and usually we would get a response pretty quickly.

Charlotte: I prefer to work with real people so we usually end up making study groups in the academics.

Katia: Yeah, we (classmates) would study together. There was one girl from my lab and then the two girls from my team and we studied together a couple times.

Chloe: I do (study with friends), but it’s only when I think it’s a last resort. Like I totally don’t understand this concept, I need someone to understand it to me. So I’m like ‘lets work together in a group!’ and it’s usually we exchange our explanations, and we get a lot more from what we’re doing that way. But I tend to not make a habit of it, because you’re depending on other people for information. Because in the end, what you study yourself and put in your brain will probably last longer than what someone tells you. That’s what I think.

Dallas: Well, working with a group is good because sometimes I didn’t know an answer and I could ask someone and they knew it or vice versa, but then there are times that all of us might’ve been stumped on a question and we would go to Piazza and check to see if anybody had answered or one of us in the group would ask it and we would wait for the answer.
One of the student-to-student tutors who was interviewed indicated that the students who attended his office hours were more inclined towards conversations about selecting future electives or career planning than discussions about lecture content.

David: The questions I got in office hours were never really about content like I did get the same people coming in and they would just like have their questions ready or, I had a group of girls that would just come in and read their notes and once they had a question they would ask it so they just wanted me there but most of the questions I had were about like just like general concern for life they’re like “oh what the heck am I going to do if I have to take the XYZ class next year like, do you have any advice like what should I do to schedule” I’m like “just relax you’re a freshman you’re overthinking it, just have fun and just do your best.” People were so nervous though

Students Use Of Piazza

Students used Piazza for communication with classmates and instructors in two primary areas: conceptual information and logistical information.

Prior use of Piazza:

Prior experience with using Piazza could influence how students use Piazza for communication. Of the students responding to the survey, 226 or 87% of respondents reported using Piazza in a class prior to CAS BI 108. Most reported experience using Piazza in CAS BI 107 or CH 101 or in many cases both classes concurrently. In interviews, some of the students volunteered differences in the way that Piazza is used in different classes and in different disciplines.

Chloe: The people in chemistry judge you a lot more. People don’t ask questions because if you ask questions, the standards are set really high, because I’m in the honors chemistry course, so when you ask a question, people are like, ‘you don’t know how to integrate the differentiation of this rate constant?!’ and it’s like ‘…excuse me.’ So. I don’t know. I don’t ask…I ask more questions in chemistry than I do biology just because it’s more conceptual, I guess, in terms of mathematics, and I’m not that great in mathematics, as much as biology, so, if I ever need help with like a formula, or, it’s usually like uh variables. I don’t know
what variable corresponds to what because there are so many x’s and y’s and everything but they expect us to know where all the variables go. Sometimes it’s hard to differentiate so I usually go on to ask about that. But otherwise, I answer questions there too. People ask very legitimate questions on that site, if you like, ask stupid things, it either gets taken down, or like frowned upon by the professors. Like the professor will come on and say, ‘you don’t know this?’

Dylan: I’ve noticed Chemistry is more about getting help from the instructors rather than the students, especially with lab reports; those are big things. I rarely see discussions it’s mostly just questions.

Edward: Yeah, we use it (Piazza) for our (chemistry) lab section but not our lecture. But for Biology it’s both (lecture and lab). They’re used the same way but I think the people who use it use it differently. I feel like the kids who use it and the instructors in the Biology course give more thorough answers and ask more nitty-gritty questions that get more thorough answers. As for my Chemistry lab, whenever a student answers it is usually very vague and doesn’t help.

Claire: For Physics I don’t use Piazza that often, I only use it to verify my answers for mathematical stuff. It’s just that for Biology its more factual and I feel like Physics is really hard to explain online, you need diagrams, you need hand numbers and movements and you can’t do that with Piazza and those are the only two courses I’ve had Piazza for. So for Biology I think it works very well because you can’t have a diagram for a heart or something but it very easy to look up a diagram for a heart or something and relate those images. I feel that Piazza works well with different courses just because some courses don’t need physical movement.

Dallas: It (Piazza) was kind of I guess better for biology just because chemistry had a lot of math in it and so for me it was better if I, someone explained it to me in person, and biology was not really math but more facts and things like that so it was more like word-based I guess. So it made it easier to like look at a question and how it was answered instead of like on chemistry where someone would have to explain their entire procedure on how they got an answer.

**Current use of Piazza by students:**

From the Piazza site itself, I was able to identify use statistics over the course of the semester. These data relate to all class users of the site and student information is distinguishable from instructor information. Since these data were collected from the Piazza site itself, it reflects use trends for the entire registered class and is independent of
my survey data. As reflected in Figure 4.5 there was an increase in the number of questions asked, response posts and unique views in the days leading up to the exam. Other peaks of activity were related to laboratory assignments and quizzes as well as questions after the fourth and final exam, when the questions were primarily focused on grading and grade distribution. There was a surprising flurry of activity (March 9-15) even during semester recess while the students labored over a laboratory assignment using Piazza to communicate.

Actual use metadata from the Piazza site, (February 2, 2014 -May 11, 2014) demonstrates trends over the course of the semester (Figure 4.5). Within this time frame, which includes spring break in March, there were 74 days in which there were more than 100 unique users on the Piazza site and 27 days where more than 175 unique users were on the site. The number of questions and responses posted, as well as the number of unique users spiked, in the days up leading to one of the quarterly exams, demonstrating that students overall asked more questions and generally used the site more in the days preceding a major exam. There were other spikes in Piazza usage but these corresponded to an instructor poll (February10) and the others might be explained by other assignments or lab quizzes. Overall, the data reflects that there were a greater number of unique users on the site at any time than there were users posting information of any kind.
Student reported use of Piazza:

As shown in Figure 4.6, nearly 89% percent of the survey participants reported using Piazza at least one time per week to help in their study of biology. In comparison, 84% of the respondents accessed the learning management system (Blackboard) at least one time per week. All of the course materials reside including the daily lecture PowerPoint slides on the class Blackboard site.
Student use of Piazza was purposeful:

Students’ reported access of Piazza use was quite varied. The survey data in Figure 4.7 suggests that more than one third (38%) of the class used Piazza equally throughout the semester, 35% reported accessing the site only when they were confused about a concept and 27% reported using Piazza more often just before major exams. From the Piazza site metadata, we learn that there were 645 posts in the class for the entire semester. A post is a question or notes. There were a total of 2100 contributions which includes post, responses, edits, follow-ups and comments to follow-ups. There were fewer instructor responses (318) than there were student responses (468). An instructor may have included any of the Piazza users registered as an instructor for the
course including three student-to-student tutors, the course director and the program administrator, one of the content professors and this researcher.

**Figure 4.7 Frequency of Student Piazza Use**

The interview data also pointed to fairly consistent use of Piazza over the duration of the semester. I asked interview participants how often they used Piazza for Biology:

**Equally throughout the semester:**

Arthur: For Biology I would say, maybe, once a week I think. Because I go to lecture each class and I don’t have that many questions about what is going on or clarification questions, but if I do it would be for sort of an event, whether there was a review session going on or if there was some sort of online tool that we could use. I would either go through Blackboard if it was underneath the content file or I would go through Piazza.

Carmen: I don’t know. I don’t have Piazza-time. It’s when I get the emails/uploads. I check those, and then exit. It varies with the amount of activity.

Chloe: And I leave Piazza open in a tab just so I can check it on a daily basis just to check every half hour just to see, ‘oh, we had problems with this,’ and then I
can help them if I know the answer, and by helping them, I can review what I just studied, and so on the exam I know it “straight.”

Sarah: It usually, I want to say two or three times a week, anytime I have a question, usually before lab, I’ll go on there if I’m finishing up the lab reports since those are main deliverables for our class so it’s just those are the things where you’d have the specific questions on so that’s mostly what I use it for and then occasionally before exams and things if I’m doing, like, review problems or things and I can’t figure out how to do a question sometimes people will have already asked about it and posted on there and then they’ll have other people answering how to do something so I’ll look at that too.

Claire: I’d say pretty much every other day. I tend to browse it really quickly on days that I don’t really think I need it and then other days I do spend time looking at it. Sure, so I use Piazza a lot more frequently in Biology especially because we don’t have discussions where as in other classes you do have discussions so you can like always ask.

Dena: I would sign up for emails to get daily emails. I would go on there about 3-4 times each week. It was pretty much equally used throughout the semester. I didn’t use it more in the first half vs the second half; it was pretty much equal.

Dylan: I would skim over the chapters, maybe look on Piazza if there’s anything new, any questions, but that’s mostly how I prepare for each lecture, I don’t go into too much preparing for it.

Edward: I’ll probably check it once a day for about 20 minutes. I’ll read through everything, all the new material.

Katia: I didn’t go on that often; I’d get the emails that someone posted a new question and I would like read the question and if it didn’t… wasn’t something that I like wanted to look at, I wouldn’t go on it. So maybe like once a week, if that.

Similar to the survey results, a lower percentage of those interviewed reported their frequency of use increasing closer to exams, however some did increase their participation closer to exam times.

**Increased Piazza use closer to exams:**

Arthur: Towards exams I do go on more frequently, just to figure out what’s the scope of the exam and what are the objectives of this exam. Like recently, the last
exam, there were some chapters that weren’t on there but were on the syllabus, so I was a little bit confused. So that’s when I would go onto Piazza and check whether these chapters would be on the exam or wouldn’t be on the exam.

Charlotte: Definitely, (was on more frequently close to exams) just to make sure because some people post things like ‘I bet this will be on the exam it’s really important.’ So I like that in particular because sometimes even in class, you don’t even notice when they say that something is really important or will be on the test.

Erin: On an average week, Piazza maybe once. Before the exam a lot more! Exams are, let’s say, every four weeks? I would probably be on the week before about four or five times. But all the other weeks, maybe once or twice if there’s something in lab that people are asking about or if there is a research paper coming up I would go on there just to see if I’m missing anything or forgetting anything because usually people will ask a lot of questions. Well personally for me I think I waste a lot of time on Piazza because I just start where it says everything is unread by me and I just start from the bottom up and read everything before the test, just in case there’s like a tricky question that somebody asks that I haven’t seen, I look at everything. And I usually do that once a week so that I wouldn’t have to read everything before the test. So every time I would get on for about twenty minutes. Even if that’s once a week, once a week I would get on for fifteen or twenty minutes. I just read through what everyone else is posting, what the LAs and TAs are posting. Usually it’s something that I already know, or it’s a date that we need to know and I already know that, or if its test rooms, and I already know that, that sort of thing, so I kind of just skip through quickly. But if it’s a question then I would answer it, every now and then. So each time I get on, even before an exam if I get on four times I would get on for about twenty minutes each time, and its usually around eight to nine o’clock, right after dinner, I would just get on to see what’s going on.

David-Student-to-Student Tutor: But overall I think (participation increased) right before tests, each before the four exams the frequency would go up a little bit. And I always felt like the people that were actually keeping up with questions when participation wasn’t an incentive were the ones that were probably maybe performing better because obviously if they’re worried about the material weeks before the exam then they’re probably in a better spot than someone that’s just asking a question the night before.

Students Use Piazza for concept development:

As shown on Table 4.4, 181 students or nearly 69% of all students searched online resources to resolve questions four or more times a week, if they had a biological
concept question. Reading other students’ posts on Piazza was nearly as popular with 162 students or 62% reporting that they did this four or more times per week.

Aggregating these data, it appears that overall the most popular ways that students tried to get answers with concept questions was through other online resources (97%) doing so more than once a week and 97% also reported that they read other students’ post on Piazza one or more times a week to get answers to biology concept questions.

Table 4.4 Resources Accessed For Biological Concept Questions

<table>
<thead>
<tr>
<th></th>
<th>4 Or More Times A Week</th>
<th>Less Than 4 Times A Week</th>
<th>Never</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posted on Piazza</td>
<td>26</td>
<td>123</td>
<td>112</td>
<td>261</td>
</tr>
<tr>
<td>Read Other Students’ Posts On Piazza</td>
<td>162</td>
<td>90</td>
<td>9</td>
<td>261</td>
</tr>
<tr>
<td>Went To Office Hours</td>
<td>16</td>
<td>83</td>
<td>162</td>
<td>261</td>
</tr>
<tr>
<td>Attended Review Sessions</td>
<td>43</td>
<td>147</td>
<td>71</td>
<td>261</td>
</tr>
<tr>
<td>Emailed Instructors</td>
<td>14</td>
<td>98</td>
<td>149</td>
<td>261</td>
</tr>
<tr>
<td>Asked Teaching Fellows</td>
<td>104</td>
<td>135</td>
<td>22</td>
<td>261</td>
</tr>
<tr>
<td>Found The Answer Online.</td>
<td>181</td>
<td>72</td>
<td>8</td>
<td>261</td>
</tr>
<tr>
<td>Met With Classmates For Face-To-Face Study Group.</td>
<td>76</td>
<td>123</td>
<td>62</td>
<td>261</td>
</tr>
</tbody>
</table>

These data were further supported by the interview data with regard to reading of other students’ posts.

Dallas: If I have questions that I come across while I’m reading or something like that (Piazza) it’s a good place to go and find other questions that people have asked that may help when other people answer them… they usually help me answer the questions that I have without having to email a professor or something like that… It’s good because it’s pretty instantaneous, which is good.

Erin: Well personally for me, I think I spend a lot of time on Piazza because I just start where it says everything is unread by me and I just start from the bottom up and read everything before the test, just in case there’s like a tricky question that somebody asks that I haven’t seen, I look at everything. And I usually do that once a week so that I wouldn’t have to read everything before the test.
Dylan: Piazza is huge because I have questions that constantly pop up while I'm reading the book because I may not get a lot of concepts.

**Students use Piazza to read questions and responses:**

The vast majority of students who used Piazza primarily used it to read the questions and responses left by other students. From the Piazza site itself, metadata was collected regarding the 580 enrolled Piazza users; 551 students or 95% of the students had spent some time reading posts and 345 students had read at least 50 posts with the highest number of posts read at 635.

Students interviewed reported that they infrequently posted on Piazza since the site was so active, more often than not, they could access the site and find the answers to the same questions that they had. The time that students spent on the Piazza site was primarily reading already posted questions and responses but there was also activity by students asking and responding to questions. From the 580 students who were enrolled in the class, 297 or 51% made one or more posting contributions. Thirty-eight students made 10 or more individual posts. Piazza also tracked questions asked and documented that 169 students (29%) asked one or more questions. Even though the posts were often anonymous, Piazza metadata was able to capture the posting and viewing information.

Among the most active student question and explanation posts, the Piazza metadata revealed that, the highest number of questions asked by an individual was 43 questions and the highest number of responses posted was 39. From site observations, it became clear that the majority of students were using Piazza only to read posts that other students and instructors had left. Additionally, the students were asked in the survey describe how they used Piazza. As reflected in Table 4.5, 80% of all respondents
admitted to only reading questions and responses left by other posters while 17% of all respondents indicating that they not only read post left by other students but additionally would sometimes post questions or responses.

**Table 4.5 How Students Are Using Piazza**

<table>
<thead>
<tr>
<th>How Students Are Using Piazza</th>
<th>Number of Responses</th>
<th>Percentage of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post questions</td>
<td>4</td>
<td>2%</td>
</tr>
<tr>
<td>Post responses</td>
<td>3</td>
<td>1%</td>
</tr>
<tr>
<td>Reading questions and responses</td>
<td>210</td>
<td>80%</td>
</tr>
<tr>
<td>All the above</td>
<td>43</td>
<td>17%</td>
</tr>
<tr>
<td>Total</td>
<td>261</td>
<td>100%</td>
</tr>
</tbody>
</table>

The majority of the participants (80%) self-disclosed that they were simply reading questions and responses on Piazza posted by other students and instructors. By primarily using Piazza to read the questions and responses of other classmates, students were not actively using Piazza to communicate with other students or with their instructors. In the interviews, students reported that they were using the information primarily as a resource for their own use as documented in the excerpts below:

Katia: Well I didn’t ever really post in it, but would read questions ‘cause a lot of questions people posted were sort of things that everyone wanted to know.

Sarah: I mean, I don’t post as many questions or posts or anything like that and that’s generally because with such large classes someone has already posted the question I have so it’s nice to go through if I have anything I don’t know or anything that I can figure out then I can usually go on there and find the answers that I need.
Neva, I mainly use it, if I have a question, I will look on Piazza to see if somebody has already asked it and if it has been answered. Because a lot of times, I can find it there. If it is not on there (Piazza), I’ll look through some other resources to see if it is in the notes or in the reading, and then if I still can’t find it, then I will post a question.

Chloe: I mostly answer. But for this last exam, I was studying, and there were four terms and the process overlapped at some point, and I was like ‘what distinguishes this from this exactly?’ because I know that there are similarities, and they produce similar products, so like, what is this specifically for? Because they’re like, ‘this can be aerobic or anaerobic, and so can this one’ and they both use the same thing, so on the test, of course, I couldn’t distinguish them. So I asked one question, and it got answered by a student tutor, and it was very efficient and great. Otherwise I usually just answer.

Dylan: I post responses if I’m confident, if I really actually get the concept. I don’t want to give any misinformation out. It’s mostly questions for me, honestly.

Carmen: yes (I post questions and responses). Sometimes they are already answered. I try to answer questions when I’m confident. I don’t want to post the wrong answer. It helps me solidify my own knowledge that I know it well enough on my own. It’s beneficial to both parties as a review.

Aaron: Most of the time I read what people have posted and how they have responded. I have asked a few questions in the past. I have tried to answer the questions but sometimes the questions that I could answer have already been answered.

Archie: I use Piazza mostly if I have any unanswered questions, and they are more last minute and I am thinking of them while I am doing work. They (the questions) might not be directly answered in a lab manual or a text book or something like that, I assume that someone else has also had that question so then I would go on Piazza to see if the question has already been asked and answered. If it hasn’t then I would ask it myself.

**Students are asking conceptual and administrative questions:**

As shown in Table 4.6, the survey data demonstrated that 79% of the students accessed Piazza more than once a week for help with conceptual questions. Seventy-five percent of students used Piazza as a resource for administrative questions for example which chapters were on the exam and questions regarding grading. Eight-seven percent
used Piazza to gain information regarding the laboratory for example format of lab reports, number of graphs required and information regarding lab quizzes. Checking on homework due dates was less important however 58% of students responded that they checked Piazza for this information more than once a week.

Table 4.6 Piazza Use For Assistance For Different Question Types n=261

<table>
<thead>
<tr>
<th>Question Type</th>
<th>Percentage using more than once a week</th>
<th>Never use for this purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept Questions</td>
<td>79%</td>
<td>21%</td>
</tr>
<tr>
<td>Administrative Questions</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Homework Due Dates</td>
<td>58%</td>
<td>41%</td>
</tr>
<tr>
<td>Lab Questions</td>
<td>87%</td>
<td>12%</td>
</tr>
</tbody>
</table>

Both the survey and the interviews were aimed at identifying what type of content the students were seeking on the Piazza site. Two hundred participants entered text-based responses about how they use Piazza and the types of questions that they either asked or searched for on Piazza. These data indicate that students used Piazza primarily for conceptual questions, administrative (procedural) details or to clarify issues surrounding the laboratories. In addition, students interviewed further confirmed these findings.

Biological concepts:

Survey Participant 247: Piazza helps me to learn concepts in new ways, and it is helpful to hear things in slightly different ways than in lecture.

Survey Participant 95: It helps me make sure I understand topics and information presented in class.

Survey Participant 21 Using Piazza is extremely beneficial in learning biology because it helps me understand topics and ideas that I would have not understood
otherwise by myself. Sometimes going to office hours doesn't help and so I use Piazza to understand material.

Survey Participant 108: It helps clarify confusing concepts

Survey Participant 133: It helps reinforce concepts discussed in lecture, and clarifies any points I may not have understood from lecture or the textbook.

Survey Participant 148: It helps to inform me of which biological concepts I should concentrate on learning.

Survey Participant 220: If I have trouble with a concept I check Piazza to see if others have struggled with the same thing and then go over what the professor has said about it.

The survey data was further supported by the interviews.

Dylan: And then Piazza is huge because I have questions that constantly pop up while I'm reading the book because I may not get a lot of concepts. That’s how I prepare.

Dallas: More conceptual (questions), definitely.

Dena: More biological concepts were my focus (on Piazza).

Claire: Yeah, so there's no one to really ask, so for me Piazza is a go to for when I have a question because for lab the TF doesn’t really know what’s going on in terms of lecture, he is very knowledgeable in terms of lab but I can’t really ask him anything else and I don’t want to constantly email my professor just because they may not respond in time just because professors are always busy and that has happened to me before because they probably already are bombarded with so many questions so I go to Piazza a lot for my questions. I have posted on here; I think a lot, I don’t know what a lot is in other people’s minds. And I answer questions on a time to time basis, especially when I go through, especially before exams and I'm going through questions to help me for an exam and I see something is unanswered or wrong and I know the right answer, I’ll answer it then.

Katia: And then I would look at the questions about concepts but it was more to like reinforce what I thought I knew, rather than like clarify something.
**Administrative issues:**

Through the text-based survey responses and the interviews, it became clear that the student questions related to labs and homework were primarily administrative so I have included those responses under the heading of administrative content.

Survey Participant 61: (Piazza) provides an interactive environment where students can obtain information about class material or exam dates and other homework.

Survey Participant 129: I read other students' questions regarding logistics of a certain assignment when I am unsure.

Survey Participant 175: I use it to find out format information and exam information.

Survey Participant 152: Piazza is mainly used for clarification on terms, assignments, and instructions.

Survey Participant 256: Piazza is very effective with communicating administrative details, such as problems with clickers, due dates, etc. The only times I really use it is for when the administrative purposes are not clear.

**Laboratory use:**

Students used Piazza for help on how to format lab report or to understand how to prepare for lab quizzes.

Survey Participant 88: It is most useful when I have formatting questions for lab.

Survey Participant: 165: How to format lab reports and important announcements

Survey Participant 66: When I use it for biology, it is mainly when I am having trouble with a certain part of a lab assignment and check Piazza to see if someone else has had the same problem and asked a question about it. Every time so far somebody has already asked about the issue and I'd say the responses are helpful in my understanding of the material around 2 out of every 3 times.

Survey participant 67: Mostly useful for lab, because the lab directions are not usually extremely clear, and so piazza really helps me get a sense for how other people are executing their lab report.
Survey Recipient 261: Piazza is extremely helpful with lab/exam prep questions.

In interviews, I found that students used Piazza heavily to help clarify expectations for lab reports and for understanding prompts.

Edward: I find that it’s helpful for lecture but it’s definitely even more helpful for lab, just because I can never get through a lab without at least one or two issues and usually the issues I have, the other people have it as well and they ask it and it’s usually cleared up pretty quickly. No not really the technical aspect, more like just clearing up what a certain part of the lab is asking us to do. Sometimes the prompts seem a bit vague.

Aaron: The way that I see Piazza is a place where if people have a general question either about the material and it is actually more stressed on lab right now have a place where people can ask a question about how to format the lab, a place where people are format of data presentation of data, qualification of data. A place where people answer questions and not only answer questions but also to see what other people are asking questions among themselves to see if there is any place where people can offer what to relate and what questions they can answer themselves/can ask questions.

Chloe: Some people for difficulties and some people who just want the answer. It’s like…because it takes a while to take the prelab quiz, and they’ll be like ‘oh, the information is in your lab manual’ but it’s in the lab manual, and convoluted in the quiz. So it takes a while. And I understand that people don’t have 3 hours to fully understand the lab material, so they ask on Piazza for help conceptually. But there are some people who take a picture of the quiz and post it on Piazza asking for answers, and people just give them to them. That’s the only thing I can think of.

The survey and the interview results suggested that the way that students used Piazza and the type of information they were seeking could vary over the course of the semester. On any given day, a student may use Piazza to clarify a biological concept and on the next entry may be seeking logistical information about exam times.

Survey Participant 32: Piazza helps immensely in the clarification of concepts from class and it eases any worries about administrative details.

Arthur: It depends because sort of towards exam time it becomes more about administrative questions, but before that it’s more conceptual questions. So I
guess as a student moves from when they start learning to the exam they want to start understanding first and then figure out where they need to be so I guess it sort of works along a time line.

David (student to student tutor): It went from content based to a lot of grading (questions) towards the end when people got really stressed out. I think the peak of content questions at least from what I can remember was probably towards like the second exam. It (the questions posted) went in cycles, so one big lab exam, not a lab exam, the lab papers when the reports were due almost all the questions were “which graphs do we need here,” “which part of the lab manual do I find this in? So that was the time when we were like “oh I wish the learning assistants were here (on Piazza)”

From the actual screen shots, I separated procedural from conceptual questions. At this level some of the procedural questions were related to homework and lab reports but what they had in common was some administrative detail. There were 410 administrative posts during the course of the semester. If the post related to something that was administrative, for example, exam averages, it was classified as a procedural post. Transcripts from three procedural posts are below.

**Representative posts about administrative details:**

Question: How much of chapter 7 are we supposed to read? Is it only 7.1(end pg 131) or are we supposed to read the whole chapter?  
Student Response: Just 7.1 and 7.2.

**Representative post about lab details:**

Question: IMPORTANT LAB QUESTION? I had a lab today from 9-11 and now it is cancelled. Will there be a makeup lab scheduled like there was last time on a Friday/Saturday or do we need to sign up for another lab?  
Instructor response: I just an email to ALL students in Wednesdays lab, please check your inbox.

**Representative post about grading:**

Question: What was the exam average for test 3?  
Student response: mean is 72.97 with standard deviation of 13.96.
There were 223 questions posted related to biological conceptual issues as represented the brief transcript of a question about autophagy below:

**Representative post about biological concepts:**

Question: What is autophagy? The book defines it as a process in which cells are programmed to destroy itself. Why is this the case, and more importantly, why is it important to our survival?

Students response: It prevents cancer and the spreading of infections.

**Student Perceptions of Value Added**

**Access to information:**

When asked how Piazza supported their study of biology, 216 survey respondents from the total 261 Piazza users responding entered text responses indicating that the access to questions and responses left by their peers was an important reason why they used Piazza in their study of biology. They appreciated being able to read the questions posted and responded to by their classmates. They indicated that if they had a biology question, they could go on the Piazza site and most likely another student had already posted it. Students entered statements in a text response portion of the survey and indicated that the Piazza site was also a good way of checking if they had overlooked any information in lecture. The larger theme of access actually had two different subcomponents. Timing of information access was an important aspect of the text responses. Twenty respondents wrote that either the immediacy of the responses or the knowledge that peers were on the site and would respond to questions almost 24 hours a day, was a valuable feature of using Piazza for biology. Peers and instructors answered questions posted with a semester average response time of 59 minutes.
**Access 24/7:**

Survey respondent 26: Many answers and explanations are posted on Piazza, allowing easy access to information discussed in class.

Survey respondent 76: It makes it much easier and faster to get questions answered because there are nearly 600 people available to answer my questions instead of only one teacher.

Survey respondent 101: If I am unsure about something that I've learned in lab or lecture and I can't find it anywhere else I like having Piazza to help find the answer.

Survey respondent 146: It helps me that if I am studying at a time that nobody else is available, I can check online and mostly find the answer to my question because somebody else might have already asked it.

Survey respondent 171: It gives easy access to communication with the rest of the class and reassures my knowledge.

Survey respondent 175: Most importantly if it's late at night and you're stuck on a concept or the format of a lab, you can post on Piazza and someone—especially the LAs—is there to answer you and help guide you through your problem.

**Clarity of peer explanations:**

Seventeen respondents of the 216 survey respondents who mentioned access expressly entered statements suggesting that reading an explanation from a classmate or from a student-to-student tutor resulted in making the information more understandable and easier to understand:

Survey respondent 73: Classmates post questions about concepts that sometimes I do not understand, and student responses tend to be better than the instructor's because the student responds in a way that is at my level rather than above it.

Survey respondent 74: People usually have the same questions I do, so it's helpful to see instructors answer those questions as well as students so you can get two definitions and see which one sticks better with you. Sometimes it's easier to read student responses because it's worded in a way that's more easily understood.
Survey respondent 107: I am able to see a different perspective by other student's responses, which may be easier to understand than the textbook or the lecturer.

Survey respondent 35: it allows me to ask questions and get responses quickly and allows me to check my own knowledge by responding to other student's questions.

Survey respondent 110: Often students' responses are more "dumbed down" than lecture or the textbook which makes them easier to understand.

Respondent 208: Seeing responses from other students is valuable to me because it is usually presented in a way that is different from how it was presented in lecture/lab. Sometimes approaching a problem from a different angle is very useful.

Respondent 236: It helps me to learn things by having them expressed in a different way since it's usually coming from a student.

Interview participants reinforced the statements voiced by the survey respondents.

Aaron: If anything I think it is the easiness of getting an answer to a question without having to leave your dorm. You would not need to trek across campus to find out the answer to a question about how you should be transporting your data in the lab.

Dallas: Really just the accessibility… if I’m up late working on a lab or something and it’s like two in the morning or something, I can’t really email my professor and get an answer you know right away but I can always go to Piazza no matter what time and you know usually 90% of the time I’m able to find an answer or stumble upon something that leads me to the correct answer, so I think my favorite part about it would be just the accessibility and how it’s somewhat instantaneous.

Diana :I really like the fact that if I have a question, I can go on Piazza get it question answered. I like that fact that it is pretty instant, You might not get an answer in 3-4 minutes but you get the answer in that same day.. It is a good way to ask questions and all of my classmates are on it so I can learn from the questions that they also have.
Reading posts and comments:

When students were asked to identify the single item that they most valued about using Piazza (Figure 4.8), more than 70% of students indicated that they valued reading posts left by other students and 23% valued most highly only posts left by instructors. Nearly 7% of all recipients indicated that they most valued responding to questions posed by other students. While this is a very small percentage of all the participants, I think it is important information and may have some instructional implications, which I will discuss in Chapter 5.

Figure 4.8 Single Item Students Valued About Piazza

Support of biological studies:

I asked students to indicate via the survey how they felt that Piazza helped them in their study of biology (Table 4.7). More than 85% of the students indicated that Piazza helped them to learn by reading what others have posted. Fifty eight percent of students indicated that they relied on Piazza to help to clarify administrative details. More than
50% responded that Piazza helps in their study of biology because it allows them to ask questions of the entire class community and 47% of students indicated that they appreciated the fact that Piazza provided a virtual community where class members can easily interact.

**Table 4.7 How Piazza Helps in the Study Of Biology**

Students could choose more than one answer.

<table>
<thead>
<tr>
<th>#</th>
<th>Response Choice</th>
<th>Number of Students</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>It allows me to ask questions of my class community.</td>
<td>131</td>
<td>50%</td>
</tr>
<tr>
<td>2</td>
<td>It allows me to test my own knowledge by posting responses to posted questions.</td>
<td>69</td>
<td>27%</td>
</tr>
<tr>
<td>3</td>
<td>It allows me to learn by reading what others have posted.</td>
<td>222</td>
<td>85%</td>
</tr>
<tr>
<td>4</td>
<td>It allows me to learn by reading what instructors have posted.</td>
<td>200</td>
<td>77%</td>
</tr>
<tr>
<td>5</td>
<td>It provides a virtual community where students can interact easily.</td>
<td>121</td>
<td>47%</td>
</tr>
<tr>
<td>6</td>
<td>It makes the class seem smaller because students are able to exchange ideas through Piazza</td>
<td>59</td>
<td>23%</td>
</tr>
<tr>
<td>7</td>
<td>I am able to check on important administrative details such as exam dates or report format questions.</td>
<td>151</td>
<td>58%</td>
</tr>
<tr>
<td>8</td>
<td>It helps me in other ways; please indicate in the text box.</td>
<td>5</td>
<td>2%</td>
</tr>
<tr>
<td>9</td>
<td>Piazza does not help in my study of biology.</td>
<td>19</td>
<td>7%</td>
</tr>
</tbody>
</table>
In the survey, students were asked to enter information as to how Piazza helped them to learn biology. The students also had an opportunity to add text responses in the survey and were also asked this question in interviews. Students reported that they valued Piazza as a resource to learn conceptual content from the posts left by other students.

Respondent 222: I really enjoy Piazza because I know that if I am confused about something or don't know how to do something, the answer is generally already on Piazza because there is a classmate that has the same problem. I think it is one of my favorite resources.

Survey Participant 238: I can get many different perspectives of biology and help from my classmates. Also tests my knowledge on the concepts and helps keep me updated about the class. It is a good place to go to see what other people have questions on as sometimes you yourself have those questions a good way to test yourself to see if you can answer the questions.

Participant 237: Piazza acts as a conduit for students to communicate with one another and the BI 108 community in an effective manner. Reading answers and questions to topics relevant to my own learning is quite helpful in aiding my comprehension of the material.

Participant 168: Piazza helps me keep on track of my conceptual knowledge by confirming what I know through reading instructor's responses to students.

Chloe: But there are always pieces I’m missing, so I read the book, take quizzes, test myself, talk to other people, but in the end it’s when you don’t know how other people are approaching the course, it’s really useful to go onto Piazza and be like, “oh, they’re having trouble with this. Have I covered this yet?” and I use it not as a primary, like I bank my whole performance on what they say and what they think. I use it (Piazza) to double-check myself, just in case they’re not on the right track, or if I’m on the right track, like what I’m supposed to be studying, because I tend to go detail-by-detail, so if the questions are multiple-choice and very broad, and I don’t do too well with that, because it’s like ‘what’s homeostasis?’ and there are four choices that are totally viable. ‘I meant this one, but these work, too!’ and I’m like, ‘do you want to give me back the points?’ So it’s like Piazza helps me focus on what the professors want, and they’ll weigh in and say ‘I think you should take a closer look at this, because everyone seems to not be getting it.’ And if everyone gets the same practice question wrong, they go back and submit a report and be like ‘you all got this wrong.'
Erin: So if you have 100% of your study material 70% of it is going to be pretty easy to study and then the other 30%, usually people have questions about it and then they would post it on Piazza. So I would go there to see that 30% and then try to answer it from there.

Charlotte: Definitely, just to make sure because some people post things like ‘I bet this will be on the exam it’s really important.’ So I like that in particular because sometimes even in class you don’t even notice when they say that something is really important or will be on the test.

Instructor B: I would say the specific questions (are the biggest benefit) because it’s obvious that they use Piazza much more than they use office hours. They are asking many more questions here (Piazza). And the answers to the questions: it goes to everybody, and not just one person. That might be the biggest advantage to this, I would rather put time in on this, than office hours because this goes to everyone and it’s documented.

Dena: For the class, whenever we approached a test or something like that, whenever there was something that I wasn’t understanding, I would go on Piazza and see if people posted questions that I was thinking of. So I would just read their questions, and check on the responses, things like that.

Dallas: Well, working with a group is good because sometimes I didn’t know an answer and I could ask someone and they knew it or vice versa, but then there are times that all of us might’ve been stumped on a question and we would go to Piazza and check to see if anybody had answered or one of us in the group would ask it and we would wait for the answer.

Diana: I really like the fact that if I have a question, I can go on Piazza get it question answered. I also like the fact that instructors are on Piazza and they can reinforce responses. Like Wikipedia people can put up answers that might not necessarily be true but Piazza has other people that can verify the accuracy of an answer and might be able to say, that a certain answer is not completely accurate and that you might want to think about the question in a certain way. I like that fact that it is pretty instant, You might not get an answer in 3-4 minutes but you get the answer in that same day. Really quick and not just instructors are on it but even learning assistants (Las) are on it. It is a good way to ask questions and all of my classmates are on it so I can learn from the questions that they also have. I use Piazza probably more to fill in gaps in my preparation. If I see something that I really didn’t understand, I will go and read about it but mostly it is to fill in the gaps. So Piazza really does not provide a structure; I do not study based on what I see. But if there are question that I do not know, I will pay attention to it. I study using my notes first.
Dylan: Piazza, it’s great because it’s real-time answers. I don’t have to go to office hours, per say, to get answers I can ask fellow students who might have the same questions as me. Instructors sometimes answer questions as well which is great if I need help on a lab report or clicker questions I can ask on Piazza, I’ll get questions back fairly soon. I go on Piazza just regularly sometimes and a student will ask a question that I don’t remember covered in lecture or in my notes and that’s really helpful because I might have missed it by zoning out or something in class.

Many students indicated that they liked using Piazza to test themselves on material.

Abby: The value of Piazza is, if you really want to learn, by answering other people’s questions helps to test your own knowledge and helps you to explain it in your own way. When you answer another student’s questions, it demonstrates that you really know the material but you have to have the free time to do that.

Archie: Yes, I have done that (testing myself) a little bit. Usually just before a test, usually as a last thing, just to see if there are any questions on there and if I can answer most of them, I feel good about it and if I can’t, then I will go back and look at more stuff.

Erin: And then personally for me when I go home, because we usually study in (not my dorm) but I would go home (to my dorm) and then maybe twice or three times I would go on Piazza, just that week before exams and I would try to answer the questions that haven’t been answered yet and that tests my ability of how much I’ve learned.

Student-to-student tutor David: Yeah I think, I definitely have a positive view on Piazza because I think that while it might not be full collaboration it’s definitely giving you the opportunity to go on and ask a question that maybe you wouldn’t have been able to find easily in the book and like I said, giving answers, the opportunity to test themselves because obviously we post quizzes for them but you never know if someone asks a question that might not have been on a practice quiz that’s something important to know, so I think that it’s great to provide that extra forum for discussion at least.

Katia: And then I would look at the questions about concepts but it was more to like reinforce what I thought I knew, rather than like clarify something.

Talia: I think it’s a very useful tool, especially right before the tests ’cause a lot of people post like their questions and the instructors are pretty quick about, you know, posting, you know, answers to them and a lot of times it’s students working
together trying to figure out an answer and I think that’s really helpful because sometimes I’ll be doing a problem and I want to see how, like I know the answer but I want to see how like to get there the right way, and a lot of students post like “okay so first I divided by this, then I did this” and that’s very helpful to see how to arrive at the right answer, essentially.

Students who were interviewed, indicated that Piazza was an important aspect of their preparation for exams.

Claire: I think it’s (value) pretty high, just because it helps me clarify information. Especially when the teacher and the book are conflicting with each other or online sources are conflicting with each other, then Piazza, if all students agree sometimes instructors will validate those answers. I know that that’s the answer I should be looking for.

Dena: For the class, whenever we approached a test or something like that, whenever there was something that I wasn’t understanding, I would go on Piazza and see if people posted questions that I was thinking of. So I would just read their questions, and check on the responses, things like that.

Dylan: It’s (exam preparation) a lot of Piazza, definitely a lot. And then Piazza is huge because I have questions that constantly pop up while I'm reading the book because I may not get a lot of concepts. That’s how I prepare (for exams).

One third of the participants interviewed indicated they thought that Piazza might considerably benefit students who were shy and who were otherwise not connected to other classmates. Some felt that the online format would benefit commuting students or those who were new to the university.

Aaron: For someone who doesn’t want to, in class, tell their teaching fellow or asked their professor specifically like “what do I have to do” and to actually have to show their actual face to them, it is great to have Piazza out there. In terms of seniority and everything like that, I feel that Piazza would be would be best for someone for whom this is the first course of this rigor and style for students who kind of like, has not had a great deal of experience college level, science courses. Whereas for Biology 107, that would’ve been a very introductory course for most people; the first biology course they would’ve taken. For me this was the first bio course that I’ve taken here, because I placed out of biology 107. Other people have done the same thing as I. It is good to have that availability open for people who are not as familiar with the setup and the running of the course like this.
Dallas: I guess maybe somebody that wasn’t really comfortable raising their hand in the lecture or going to talk to the professor because you can ask questions anonymously on Piazza so someone like that, they can do what I do, kind of just go in for what they need and just leave it at that. So, someone who I guess isn’t involved with like tutoring or study group or something like that. Also, I would say probably freshman year just because everything is so new and we’re not really comfortable having classes that are as big as biology and chemistry and so it, ‘cause it’s different asking a question in a room of 600 than in a room of like 25 students.

Arthur: I think Piazza would help the type of student that is not as able to ask questions during lecture, but they would want to ask questions, so more of a shyer person, someone who is just less confident in their academic skills, because Piazza is more of, like I said before, it’s just a clarification tool, I think. If there’s something that people don’t understand they would work together to figure it out. But other than that I don’t think that people would have long discussions on Piazza.

Paul: I'm not really sure, maybe someone who is a commuting student, someone who is part of the metropolitan college where they can't really have access to things like office hours or people in a dorm room. They only have access to online resources they can’t really chat with people, just because they live a certain distance away from the school it takes time to commute.

Chloe: I definitely think that the people that are not too outgoing, who are shy, not too confident, would be discouraged from asking more questions if the instructor knew who they are. And if they look over the exam, they’ll say ‘you were the one who was afraid to ask me this’ you know. So it’ll give them a bad image of that student but I think it’s helpful for the instructor to weigh in and say ‘why aren’t you guys asking me this question?’ in biology there’s a very open learning style, and even the professors are very friendly, so I think they wouldn’t say that to a student.

Archie: I think one who doesn’t have a lot of friends in the same biology class (would benefit the most) because I think that professors, Teaching assistants, learning assistants, don’t explain things in the best ways, probably because they have known it for so long. There are certain parts that I think are kind of crucial to the understanding of certain topics that they (Instructors) will kind of leave out and then people who are just learning it now, probably have a better grasp of what it really takes to make it click in someone’s mind so that is why I think that Piazza is important for.
Participants interviewed indicated that they thought that the success of Piazza was dependent on the participation of all students and that it potentially benefitted all students equally.

Abby: You need everyone there to make it work, you need the person who is willing to answer the questions posted, and you need the person wants to ask the question, so I don’t think it values anyone best. It is not better anyone than anyone else; I think it’s an equal thing. All aspects are of value, because the person who answers the question will review the material and demonstrate that they know the material by answering the question and the person who is asking the question, is really motivated to learn,” I don’t understand this and I am really going to go get help and I am going to do it by asking on Piazza”, I don’t think that many people do that. I know when I do not understand something I go to the textbook or I will go to my friend who lives in my building and ask them “hey can you explain this to me” or “can I explain this to you and tell me if it makes sense”.

Carmen I guess everyone can benefit from Piazza. Even in group study overall questions come up that could be asked to the whole class. There isn’t one student in particular (who will benefit).

Instructor W: It’s funny because the vast majority of resources that we offer, benefits the top students. Maybe the students who do need additional resources but tend to be the students who do not seek out additional resources need these opportunities to discuss and to talk about it. Whereas the students who are struggling, may not be the ones who will take that step (to seek out resources), I actually think that Piazza give students who are struggling a place to struggle with it (the material) before there is a grade attached on an exam.

**Empowerment in learning:**

Students reported in both the survey text responses and in interviews that using Piazza helps them to take charge of their learning. Many students see Piazza as a risk free space where they can get their questions answered and as a place where they can assess their own learning. They use the questions posted to check their own understanding and their own progress with the material. By having a place to post questions, answers and to test their own knowledge by reading other students responses, they feel more in charge of
their own learning.

Chloe: And I leave Piazza open in a tab just so I can check it on a daily basis just to check every half hour just to see, ‘oh, we had problems with this,’ and then I can help them if I know the answer, and by helping them, I can review what I just studied, and so on the exam I know it “straight.” So, um, I kind of like take advantage of Piazza, not necessarily participate in Piazza, if you get what I’m saying.

I think the stupid questions are part of the learning process, as dumb and as head-breaking as they may be to see them flow into my email box, but it definitely helps them feel more comfortable with the subject, because they’re not held back by anyone. Like, ‘go ahead and ask the stupid questions, there’s probably someone else in the class with the same question, because biology has 300 people in it, while my intensive-chemistry class only has 30.

Diana: Piazza makes me more in charge of my learning because I am not just waiting for what the professor is giving me to learn but that I can get what I need. I can go to a lecture and I have to sit through the whole thing. When I am on Piazza I am deciding what I can take from it.

Instructor W: There is something very meaningful about teaching students how to find the answers for themselves. Too often, they do not even try to find the answers. So if trying to find the answers, means going to Piazza, and posting the question, that is still better than coming to me and saying what is the answer to this?

Katia: And then I would look at the questions about concepts but it was more to like reinforce what I thought I knew, rather than like clarify something.

Perception Of The Instructor’s Role

Students were asked if communicating through Piazza has changed their perception of the role of the instructor. This question was inspired by the some of the literature that suggests that when the students have the opportunity to collaborate, role of the instructor actually changes from a provider of all content to a guide who helps to facilitate their learning (Bruffee, 1999; Resta & Laferriere, 2007; Weimer, 2002).

The majority of the 27 students that I interviewed reported that the role of their instructors had not changed at all even though the students had an opportunity to interact
together through Piazza. Biology 108 is a traditional lecture based course. From my interviews, I understand that there was little opportunity classroom discussion. The lecture based format is still most widely used in large undergraduate science classrooms. Evidence suggests that overall the perception of the instructor’s role remained unchanged although a few students thought that the role had shifted slightly to a more facilitator role.

Aaron: I feel like faculty role has stayed the exact same. The only changes that this collaboration between students has been placed technologically online than in person. I feel like 20 or 30 years ago when this course would have been taught, students would just meet up with a friends, and with others and just have some kind of a study group in person rather than kind of just having forum open online with students could just freely ask questions and answer them like that. It’s just that the advancement of the times rather than any change in the faculty; faculty has stayed the same.

Abby: In terms of the biology class, I think it depends on the professor to be honest with you. Because in our class it is split between two content professors, I think it does shift a little bit, not that much. With the first professor, I felt like we needed to learn a little bit more on our own regardless. His lectures were sometimes different than what was in the textbook. The second professor was different, he really was clearer about what we needed to know, and really reinforced his role as the instructor. Whereas with the first instructor, we were really helping each other as students. I think I saw more lecture-based questions when he was teaching. Then when the second professor was teaching, I feel that the second professor with better at explaining things so we needed to rely on each other less when the second professor took over the course. But I don’t know it really does not devalue position of the professor. Or at least it has not shifted too much. We still need to look to the professor for reinforcement.

Dena: I don’t think that the role of the instructor has shifted but I do feel that it makes students feel that they have more control which is a good thing and we are ultimately paying for the classes.

Annie: I think they're (the professors) like the primary source of information, and, well, besides the textbook. I read the textbook first and then I go to lectures hoping to enforce what I learn in the textbook, but I don’t think that things like Piazza make them less important for the learning process. I think that they’re just as important and I think that the virtual, like Piazza and things, those are just supplementary. I think that it’s still really important for the professors and lecturers to have a major role.
Archie: I think that professors are still seen as the top body of knowledge that you could go to. I think that Piazza is just a different outlet for what students have been doing for their whole life, conferring with each other, studying with each other, it is a little more accessible now in that if people tend to keep to their selves they can still participate. I think that the instructor is still a figurehead.

Dallas: I think the instructor is there to kind of introduce us to the information, but having student-to-student communication works really well because sometimes the way that an instructor may present a piece of information I might not understand, but going to another student they may be able to put it in different vernacular that could help me to understand it better than the way that the professor presented it. So I guess the professor has maybe more become just someone to introduce material instead of like a teacher who I guess in like a smaller classroom would teach, if you had a question your raise your hand they can like come to your desk and help you with the problem but now professor in a class so big they just really are there to introduce information and then I guess during office hours they can explain and stuff like that but using other students you can get it in a way that you understand.

The current structure of BI 108 is still lecture based. In terms of that, the primary role of the instructors in BI 108 is really that of content providers in a classroom setting that provides minimal interactivity. Those instructors who agreed to be interviewed suggested that the goal of Piazza is to encourage students’ interaction with the material well before they will be tested on it and to encourage peer-to-peer engagement.

Instructor W: The lecture is structured such that it is straight lecture for the full class. So there is minimal interactivity. In these large lecture formats, nobody asks questions. Nobody does. Every now and then a student will raise their hand but it is usually, the one student who tends to be very outgoing who doesn’t mind raising his hand in a group of strangers. So questions and answers are minimal. It does happen but not a dynamic discussion. A lot of times students just they come in, they listen, they watch, they scribble notes or type notes and they really do not have a chance to think about it. They come in two days later and they do the same thing and three weeks later we have a test, They say,(at that point) I don’t know any of this stuff. So I do hope that Piazza encourages them to think about the material as it comes up. Even if they just go on Piazza and read what other students post, that still can accomplish that same goal because they may read a question and say, “Oh yah, I am confused about that question too”.
Instructors cautiously favored Piazza but raised concerns about disrespectful or terse posts. Another instructor raised concerns about Piazza potentially making it easier for students to skip class and still have access to course content. The instructors were all favorable about having students ask clarification questions of each other. As one instructor reported:

Instructor W: Giving students one more resource where they can feel comfortable posing questions on places where they are confused (most important benefit). Secondly, the aspect of peer teaching, that is really important for students to be able to ask and then respond to other students’ questions. Even some of the logistics questions, a lot of students will say, oh, the answer to your question is on the syllabus and it is on this page, and it says this. I love that! I think that is great! And then of course there are the content-based questions where the students will answer each other as well or clarify confusion.

Instructor W: There is something very meaningful about teaching students how to find the answers for themselves. Too often, they do not even try to find the answers. So if trying to find the answers, means going to Piazza, and posting the question, that is still better than coming to me and saying what is the answer to this?

Allowing the students the opportunity to ask questions of each other was also echoed by one of the student-student tutors as one of the most important benefits of Piazza.

David, student-to student tutor: I definitely have a positive view on Piazza because I think that while it might not be full collaboration it’s definitely giving you the opportunity to go on and ask a question that maybe you wouldn’t have been able to find easily in the book and like I said, giving answers, the opportunity to test themselves because obviously we post quizzes for them but you never know if someone asks a question that might not have been on a practice quiz that’s something important to know, so I think that it’s great to provide that extra forum for discussion at least.

One of the instructors reported that he thought that Piazza was actually more effective than office hours since so few students attended office hours and additionally responses left by students or by faculty went to all participants instead of one or two
Instructor B: Nobody comes to office hours. I had more this year than I ever had. And I probably had a total of 10 visits. There was actually, much more interaction though Piazza than there were people coming to office hours. I would say the specific questions (are most important) because it’s obvious that they use Piazza much more than they use office hours. They are asking many more questions here (Piazza). And when the instructor answers the question: it goes to everybody, and not just one person. That might be the biggest advantage to this (Piazza), I would rather put time in on this, then office hours because this goes to everyone and it’s documented.

Instructor W offered the following regarding the value of the Piazza site for students:

Instructor W: Students always asked valid questions about what we were talking about. So similar to that, giving them an opportunity to ask a question, knowing that an instructor will answer it, (they do not need to come to office hours; they dislike office hours for whatever reason) very few students will utilize the tutor’s office hours, few students will actually email an instructor; some do but not many so to a large extent, students do not reach out when they have questions so I feel like it is a low stakes way to post and have their questions answered by an instructor or at least know that an instructor is reading and making sure that everything is a valid answer.

One instructor thought that while Piazza had merit for the majority of students participating, there was opportunity for those who did not attend class to reap unfair benefits.

Instructor B: So when I looked at what people were asking on the site, I initially thought that there were not that many real questions. Actually I guess they were few. Some people wrote questions about lecture, and I try to answer them as well as possible. And people have a lot of questions about grades and tests, how the scores were going to work, curve and that sort of thing towards the end of the class. The site looked okay, I mean, some of the questions were stupid. You could tell that they had not been class and they had no idea of what was going on. They would ask questions that were just so far wrong, it was clear, that they had no idea what was going on. The way they mixed up concepts, it was almost humorous.

The issue of respect in Piazza posting was raised by one of the instructors and one of the student-to-student tutors. Some students took advantage of the cloak of anonymity
and exhibited mean spirited rude behavior towards their classmates.

Instructor W: Yes, a student came to me and it was a student that I knew, and he was comfortable coming to me and talking to me. “He said, you know I just don’t get it, (I am paraphrasing) why do people feel the need to be a jerk”? If someone asks a legitimate question, why would the response was something along the lines of “well you are an idiot if you do not know that.” Yes, and he (the student) said, “you know, I just don’t get it, it is almost bullying and we ended up having a very, very good conversation about things like that. I did actually go in and I deleted that comment (that he referenced). I do like having that kind of final control. It was just someone, for whatever reason, felt the need to put someone else down and of course, in an online environment, it is almost anonymous. They can set their posting profile to anonymous. There is almost a shield of “no one knows who I am so I am going to say something rude here.” I only once read a comment where I felt that it was rude and I had to delete it. Other than that, I do feel that the students ask questions and get really good answers. If people are posting anonymously because they are feeling insecure, they certainly do not need see those kinds of responses.

Instructors were also asked in which ways Piazza helped them as instructors.

Instructor W suggested that viewing the posts on Piazza gave her an indication of how the students were managing the course content and also informed her of the areas in which many students were struggling.

Instructor W: I think it is a very nice window of opportunity to see into the student’s world. You can see the common questions that come up or common threads, confusions; it will give faculty the chance to revisit content on which there is a lot of confusion. I do this all the time. If I know that there is material that I covered three days ago and I know there in which there is a lot of confusion, I will spend another half an hour covering it even at the expense of not covering stuff I have yet to cover. Sometimes, I just feel that the faculty will start, go all the way through the material, and then you end. So I like Piazza for that ability seeing where the students are struggling.

Instructor B: I never got many emails with questions, this was much more interaction than I ever got by email. The advantage is that the responses to everyone. I would rather spend time doing that there than to send an email to one person because it takes the same amount of time. Towards the end they were concerned with grades and during the lecture, probably 60 to 70% of the questions were related to lab, write-ups and data.
When asked in which ways Piazza might enhance the BI 108 community at least one of the instructors indicated that Piazza may provide a bridge helping to unify the course somewhat fragmented by multiple instructors and content areas. Piazza may be a way of standardizing communication and methods of inquiry.

Instructor W: Well, one of the challenges of this class, of these classes is the fact that they are team taught. So it is difficult to unify across lectures. Now, in fact, we have a third lecturer in BI 108, so sometime there are seven lecturers over the course of an (academic) year, so there are some challenges, by virtue of that fact. And then, to build in things for me to say to the students, you know if you post three times, here is this built in reward system. I do not know if other faculty would do that, I don’t know if they would buy into that. I do not know if they would check Piazza and go through that process. So standardizing usage would help a lot.

Since the students reported very positive responses for having faculty feedback on the site or at least having instructor endorsements for good answers, I asked instructors what they thought about potentially holding online office hours on Piazza. Specifically, instructors were asked if they might be open to dedicated predictable times when they could commit to being online actively answering questions,

Instructor B: The site is very easy to use. It’s nice software. I think that getting student participation would be better. I think that if you did have an hour, when you actually have live chat on the Piazza site, it would be good. Whatever it takes to improve student participation would be good.

Instructor W: Interesting. I never thought about that. Because what I have been getting from some of the students is that they have schedule conflicts. At the end of the semester, I meet with the faculty and debrief about the semester and grades. At the end of the fall semester there are four of us and at the end of the spring there are three of us (well there will be four next spring), we always talk about office hours and we always talk about the student that we had. No kidding, every single one of us can count the number of students that we had during their lecture time on one hand. Which is stunning considering there are 600 students in the class.
David, Student-to-Student tutor: Yeah I mean as an instructor I would definitely feel comfortable with doing that. I mean I had always thought that like if they were friends with me on Facebook which they weren’t obviously ‘cause that’d be weird but if they were using the chat might’ve been useful because obviously first of all email isn’t something I check every couple minutes but if I had, if I gave it a lot of time to sit down and look at Piazza ‘cause I knew “okay we’re going to have, three hours I’m going to be available on Piazza” and they were sending me chats I think that would be useful, but at the same time if those chats are hidden from other students then I think you’re taking away part of the advantage of going on and seeing other people’s questions.

Suggestions For Improvements To Piazza

Of the 261 Piazza users who responded to the survey, 185 participants entered text responses when asked what they thought could be improved in Piazza. Most of the participants (66%) indicated that the organization of Piazza could be improved. They felt that the interface could be confusing and it was hard to find to locate the topic that you were looking for easily. There were recommendations for the grouping of posts on a similar question or topic.

Survey participant 247: There should be a better way to categorize questions. Having separate sections of Piazza for lab, lecture, and administrative questions would be helpful.

Survey participant 185: Folders that organize topics based on topic instead of time posted. Perhaps just have separate categories with labels and all of the relevant posts go in that category instead of on one main one. Ex: all lab questions are posted together while all lecture questions are posted in a different place. Nothing too specific, or questions could get lost in the shuffle, but it would be valuable if you are, say, looking for help on a lab specifically. Then you wouldn't have to sift through all of the lecture questions looking for relevant posts.

Although the average time that it took to respond to a post was 59 minutes, some of the students felt that that needed improvement and many expressed an interest in having instructors participate more in the discussions.
Survey participant 63: The general answering time for questions right now is about 48 minutes, so that can be something that could be worked on.

More than 35% of the survey in-text responses indicated that they hoped for greater instructor participation especially when conceptual questions went unanswered for a long time or if a student response seemed confusing. The students did not often distinguish between the professors in charge of content in lecture classes and teaching assistants or student-to-student tutors. Eighteen of the 187 respondents did make that distinction and made recommendations for greater participation of teaching assistants and for format changes to make it easier to locate lab specific questions and answers.

Survey participant 98: Faster professor responses and checking if student responses are correct.

Survey participant 39: Sometimes there are questions that are never answered and it would be helpful if when a professor sees a question that has not been answered he or she leads the student in the right direction to getting that answer. Piazza is great for student communication, and the student teachers and even professors do help out on there, but I think they should help out even more, sometimes the students are really struggling and I think a greater presence from the professors would be helpful.

Several students suggested instructor posting to encourage student-to-student collaborations.

Survey participant 226: A second way (Piazza could be improved) would be if instructors occasionally asked questions to make everyone work together to answer, I feel like that could be interesting.

Survey participant 187: Have the instructors post questions for students to answer.

Ten students responding to the survey question about how Piazza could be improved provided answers suggesting that they did not understand how to use the Piazza site. These responses suggested that the students may not have been properly trained in
how to effectively use the site even to the extent that they did not know how to modify
the email alerts.

Survey Participant 63: Be able to set the email alerts to every other day instead of
daily.

Survey Participant 89: make setting email preferences more straight forward.

Survey Participant 91: get rid of annoying emails

Impact On Community

Enhancement of communications:

When survey participants were asked about how Piazza helped in their study of
biology, more than 50% reported that Piazza allowed them the opportunity to ask
questions of their class community and 47% reported that Piazza provided a virtual
community where students can easily interact (Table 4.7). In test entry responses, survey
participants cited the benefits of learning from their classmates and how using Piazza
allowed them to feel part of a larger community as valuable aspects.

Participant 29: (Piazza) connects me with my classmates - creating an open
environment of joint learning.

Participant 242: Piazza allows sharing of communal knowledge.

Participant 23: Piazza is a good place to go to see what other people have
questions on as sometimes you yourself have those questions and a good way to
test yourself to see if you can answer the questions.

Participant 31 Piazza is a tool which allows me to be able to ask questions freely
and learn from the questions/responses of others.

Interviewees were asked if they thought Piazza was helping to create a class
community or did they tend to see it as a toolbox where they can pick and choose
according to their individual needs and then go on their way. While some students tended to see Piazza as a learning community, others saw it in a very individualistic way as a resource for their personal gain.

Erin: I definitely think it’s a community of learning, definitely, because even when its people I just met we would talk about Piazza, like ‘did you see that post about this and that’ and like ‘oh yeah I saw that it’s like this and that’. And last year we would talk about Piazza a lot just because questions in chemistry, I personally think, were more difficult than in bio so we would just discuss what questions were put up there and stuff like that. So it’s definitely a community. My friends use it a lot. We love it.

Dallas: I think it’s kind of both (a community and a toolbox), because I would see some people make study groups from it but then there were some people that… like for myself I didn’t really need or wasn’t really going to look for a study group, I would just go like when I had a question, so I guess like a toolbox but I knew some who used it as like a community and ways to set up study groups. I so guess it goes either way. I think it’s (more) collaboration, you know some people are playing the role of just asking the question some people are there to answer questions so I think it’s working together.

Diana: I use it individually—to enhance my learning. For the most part I am going on for things that I need.

David, Student to student tutor: Well I never thought it was so much collaboration as kind of collaborating but for individual gain, it’s not so much you’re working together as someone’s asking a question because they really need it answered immediately, ‘cause like the most use most students got out of it was right before the test they had a question to ask, so they’d ask it and they actually really needed an answer kind of immediately ‘cause the test would be the next day.

*Increased level of connectedness*

Piazza in BI 108 was a student run group. Students remarked that they felt that the Piazza site was for and by students. Metadata from the Piazza site reflects a total of 2100 contributions. These contributions include posted, responses, edits, follow-ups and comments to follow-ups. Students posted more than half of all the responses to questions.
as well as follow-ups and comments. The number of student posted questions and responses suggest that overall the students valued information from their peers. Site observations, site metadata and interviews all suggest that the Piazza site was a student run group that was largely managed by the students.

Instructor W: Yes, it (Piazza) absolutely contributes to a learning community. It give the students a forum where everybody gets the same experience. It is actually an interesting distinction between the whole collaboration piece but still being part of a learning community.

Diana: “… because just by asking a peer a question or asking a peer for more information, it may provide you with the information that is more accessible and understandable to you. So sometimes I have asked a professor a question and they are explaining it and I am not necessarily comprehending it because… I don’t know they may be smarter or they may be using terms that I do not necessarily know because they have been doing for so long. But if I ask a student who is doing well in the class they may say…”well why don’t you look at it this way”. A peer may be able to present it in a way that is way more simple and I am able to get it”.

Archie: I feel like it is student (run), I guess from most of the answers that I have seen come from other students, there is also a portion of instructor or professor answers, I think that there is a lot of student fueled question and answer dialogue that is the most helpful part.

Dena: Instructor didn’t post all that often. If anything it was mainly student run. If he did post something, it was because several students posted the same question and no one was coming up with the answer. Students were emailing him to answer.

Unity of purpose

In addition to the perception that the students were really running the Piazza discussion, many students expressed a comradely and unity of purpose with their classmates.

Dena: (It was) more of a team effort, more of we are all working together to pass this class. We all helped each other. For me at least
Dylan: (Piazza) added a sense of community too just because ‘hey we’re all in this together’.

Dallas: I think it’s collaboration, you know some people are playing the role of just asking the question some people are there to answer questions so I think it’s working together.

Anonymity

Since I was interested if students using Piazza felt a sense of community, the fact that student usually posted anonymously was of particular interest. Based on survey responses and interview questions, students appeared to be happy that they were able to post questions and answers anonymously. It provided a sense of safety where they could risk asking what might be perceived by some “stupid” questions without anyone knowing who actually asked.

Survey Participant 243: It helps me to better understand concepts and questions. I am able to post anonymously so that I am not embarrassed to ask a question that I might have been embarrassed to ask in lecture.

Survey Participant 169: Let's me ask questions anonymously.

Survey Participant 117: Allows students to ask questions anonymously and to read what other people have posted.

Abby: There is a great deal of value from learning from your peers but the fact that a lot of people post anonymously on the site gets rid of the scary feeling that you might be asking a stupid question.

David (student-to-student tutor) ; And also it gives you much more freedom to ask the professors and instructors questions that you might’ve been embarrassed to ask about grading or… Like so there was a lot of questions about grading for sure on Piazza.

Edward: I’d say my answer for that depends on whether they're posting a question or an answer. From what I’ve noticed the questions are generally anonymous because I think they don’t want to seem like they're asking a dumb question and
then they’ll post non-anonymously because they kind of want to show everybody that they know the answer and they kind of want to, I guess, show their name that they know the material and it’s impressive.

Sophia: Usually I post my questions under anonymously but I freely post my answers under my own name.

David (student-to-student tutor): I kind of wish that (Piazza was more open), I know that a lot of students are going to want to be anonymous but if that wasn’t an issue I think it would be really interesting to have students have their own like kind of page and if they want to they can update their profile and… I don’t know just, it would be cool ‘cause you’re not just anymore just posing a question, having a random person answer it and moving on, you might say “oh like this is like Mike I might make sure to thank him when I’m in person with him” so I think it gives the opportunity to say like “oh like” get to know the person that you’re actually talking to. And that might lend itself to some kind of conversation in person next time you see the person.

Instructor W: I also think that it is important to recognize that the students want to be anonymous. I do think that if there is a completely egregious post, something really outlandish, something that I did want to follow up on, then I would track it down; never felt the need to drill down to see if you could find out who posted anonymously.

All the instructors that I interviewed and some of the students indicated that, on occasion, they noticed postings on Piazza that were disrespectful either overtly in content or more subtlety in tone. I think that disrespect is a risk of this type of anonymous forum however if the students knew that the instructors could find out who posted it might guard against this type of behavior. Revealing student identities however might also deter students who are afraid that instructors might think that the questions that they are asking are stupid. I have already provided data that the students appreciated the fact that they could post anonymously, however this could lead to lack of respect.

Survey Respondent 7; (Piazza can be improved) by having students complain less/being passive aggressive with one another.
Survey Respondent 86: (Piazza can be improved by) the students should be told to stay more professional

Instructor W: I have had, this past spring, a student come in and say, “you know, somebody posted a reply and I felt it was very rude.

David, student-to-student tutor: I remember we actually brought the subject back to Course Director when kids got a little… not aggressive, but a little more rude than they would’ve been had they been in person and not anonymous

Instructor W: Yes, and he said, “you know, I just don’t get it, it is almost bullying and we ended up having a very, very good conversation about things like that. I did actually go in and I deleted that comment (that he referenced). I do like having that kind of final control. It was just someone, for whatever reason, felt the need to put someone else down and of course, in an online environment, it is almost anonymous. They can set their posting profile to anonymous. There is almost a shield of “no one knows who I am so I am going to say something rude here.” I only once read a comment where I felt that it was rude and I had to delete it. Other than that, I do feel that the students ask questions and get really good answers.

Student Motivation

Extra credit

When students were asked in the survey how Piazza could be improved, there were eleven references to providing extra credit to students for their participation. Interview participants were asked how they would feel if participation on Piazza was made mandatory or if participation earned students extra credit. Forty-nine percent of the students in BI 108 had also been in the Fall 2013 class of BI 107. Students volunteered that one of the instructors had offered extra credit to students as a means of increasing Piazza participation. The responses from students with regard to extra credit or mandatory participation were mixed. Some thought that offering credit for participation was a good idea. They felt that the incentive encouraged greater student participation and
that was overall good for all the students.

Instructor W: So you know how the class works. It is team taught, my lecture, one of the things that I did, that if every student between this date and that date, posts and answers three questions on Piazza I will give you a bonus on the exam. I pushed them into this online environment. I saw students posting something like we can only benefit if everyone does this. There certainly was a team mentality such that we are all in this together. So I did notice that but I am the only one who did that. Other than that, in all honesty I am not sure how frequently the other faculty members checked it. I know that one was on it at least once.

I don’t remember the numbers exactly but it was a high percentage of the class who participated. They loved it and I loved that it (fostered) team mentality. But it forced them to go on the site and recognize that the resource was there.

Dylan: I thought it (extra credit incentive) was great because it kind of forced people to go on Piazza and some people who may have never gone on Piazza before maybe discovered it, and that just added a whole new student base, added more students to the ones who normally used Piazza.

Katia: I think that would be helpful especially as an extra credit so people that maybe like know a lot but mess up on a test can go in and answer and if they get it right or like could be endorsed by the instructor then that could be like an extra point or two for them.

Diana: I wouldn’t have a problem with (extra credit for participation on Piazza) that. It may make me think more and not lazily study. I wouldn’t just read someone else’s questions but I would need to think about the material and come up with my own questions.

Edward: Because Biology 108 is a big class, like 600 students, and it’s clear from the Piazza site that a lot of people post on it. But a lot of people also don’t post and it might not seem that way because it’s such a big class. So I feel like if there were some extra incentive for the people who don’t really post on it, it would enhance the class.

Claire: Yeah, last time (BI 107 instructor) made it mandatory for one section of the course and it changed a lot because people went on more often just because we had to post these many and answer these many and it was kind of like a competition I guess because if someone posted a question you want to be the first person to answer so you can get the requirement out of the way. But of course when you answer you couldn’t just answer it yes or no, it had to be a thoughtful answer so I think that helped a lot because people were constantly answering and questioning and it was more of an interaction.
Some students distinguished between posting on Piazza as an extra credit incentive versus a mandatory participation requirement.

Chloe: “If it (posting) was a requirement, I think people would change their attitudes towards it (Piazza), if it was extra credit, people would participate so much in it. I know people come to lecture just for the clicker questions. The average for exam 3 was so low but everyone is like “oh 10 points!” and everyone banked up to B’s. and it gives 10 points on your lowest grade, and people purposely go to class, instead of an attendance check, the professors use clickers. So Piazza, ‘every 10 students you help, and instructor verified response, you’ll get 3 points on something. Or less.’ But if there was some kind of feedback/reward, people would be more motivated to use Piazza and answer things, instead of just student tutors.”

Students suggested that the incentivized or forced participation might dilute the authentic experience of students. They raised concerns that students were just posting to fulfill the participation requirement and that their participation was not genuine nor did it contribute to the community in a meaningful way.

Erin: If participation was required, that means that there is no anonymity, right? Because it would be graded? I think there would be a lot of questions that are unnecessary to be on there. Like if I had to have a certain amount of participation and I forget about it until the day before, I would just post like, I know plenty of people who would just post random questions that they may already know the answers to and that aren’t very thoughtful or thought out. So like, instead of asking the details of Glycolysis they would just ask ‘what is Glycolysis’ which is easy, it’s like glucose to pyruvates. It would be questions like that, so I don’t think it should be necessary, just because it would be less of a learning experience and more of a free-for-all for everyone to post random things

Dallas: I think probably a lot of people, people that don’t really necessarily use it all the time probably put questions that were pretty simple just for the credit. I think if it was tied to the grade, like it was fixed into the grade and not something like for bonus or something like that, the questions might have been more, like more conceptual question about the actual subject matter instead of like random questions just to say that they posted a question. I think that’d (mandatory participation) be good I mean I used it so I feel like that would only really be a way to boost your grade, it wouldn’t really be a bad thing at all.
Dena: If it was made mandatory: it would be ok especially if it was going to help your grade. It might change the integrity of the post because the focus of posting would be on the grade. People would feel pressured to post on Piazza so it might not be thoughtful, it might just be something for a grade. That might change how Piazza is used.

Diana: Might have the same effect on other people as it does for me and they wouldn’t be shy to ask questions but then I think that people would ask only basic questions that they already know the answers to and so they wouldn’t really be asking questions that… so I guess that would be an issue, But I don’t think that would be a bad thing.

Student-to-student tutor David: To be honest, I wasn’t a huge fan of the whole participation incentive at all because I felt like the strength of Piazza is just giving students the opportunity to participate if they want, I don’t think it should be a forced participation. That said, I think that if a student’s really struggling and reaching out to Piazza a lot then that student should maybe get some extra consideration like you know well he tried very hard maybe he didn’t do the best but he was definitely involved and he was keeping up over the course of the semester. I mean it’s different whether he like right before the test asked a few questions or over the whole semester he was like up with the material. So I feel like… I don’t like the idea of it as forced participation, I think it should be just there as a means for students to discuss because honestly with the way bio is there’s not really a chance for open discussion because like I said the lecture is huge there’s no discussion sections and labs are the only time when you would think there’s open discussion but it’s basically just talking to get the lab done.

Since I did not ask students’ permission to access their final grades, I was unable to link Piazza use to class performance.

Self-preparation

Students turned to Piazza as a resource and to aid in their own preparation for biology. They used questions posted as a means of testing their own knowledge and their preparedness for exams. They used the site to check for information that they may have missed in lecture or in laboratory.

Claire: I go to Piazza a lot for my questions. I have posted on here; I think a lot, I don’t know what a lot is in other people’s minds. And I answer questions on a
time to time basis, especially when I go through, especially before exams and I'm going through questions to help me for an exam.

Dena: For the class, whenever we approached a test or something like that, whenever there was something that I wasn’t understanding, I would go on Piazza and see if people posted questions that I was thinking of. So I would just read their questions, and check on the responses, things like that.

Diana: Yes, (I use Piazza) because I am not just waiting for what the professor is giving me to learn but that I can get what I need. I can go to a lecture and I have to sit through the whole thing. When I am on Piazza I am deciding what I can take from it.

Dylan: Oh of course, of course. I go on Piazza just regularly sometimes and a student will ask a question that I don’t remember covered in lecture or in my notes and that’s really helpful because I might have missed it by zoning out or something in class.

Edward: But Piazza helps in that I benefit from other peoples questions.

Assisting other students

Through the interviews, students primarily reported that they interested in using Piazza for personal gain however they also reported that they were happy to help out their fellow students.

Edward: I think it helps in facilitating the learning as you go along with the course and I think it just in general benefits everybody really.

Chloe: ’Il just be like, what problems did people have this week, you all had problems with like photosynthesis, and I go back and look because there are so many proteins and stuff, and so I go back and review. And when people post, people tend to spam on the same topic. So if I can resolve that, so some people can put more questions in, because I was looking today. And there were 10 questions on photorespiration, and I was like, ‘no one has answered them!’ it’s like, no one answers, and the instructors say ’read the book,’ and someone says, ‘I don’t want to read the book,’ and I’m like trying to scroll through things I actually need to study and it’s like ‘you don’t understand photorespiration?!’ and I read the book for 10 minutes and I write to them and say ‘this is what it is’ and they’re like ‘good!'
Carmen “Yes. Sometimes they are already answered. I try to answer questions when I’m confident. I don’t want to post the wrong answer. It helps me solidify my own knowledge that I know it well enough on my own. It’s beneficial to both parties as a review.”

**Summary Of Results**

I found that most of the students came to Biology 108 with a good deal of experience with and access to technology. Most students used Smartphones or laptop computers on a daily basis and had substantial experience using social media, especially Facebook and YouTube.

Students used Piazza primarily to access information posted by their classmates and to a lesser extent, by their instructors. They used the site in very individualistic ways. Piazza use was almost equally split between those who access Piazza only when they do not understand something in class (35%), those who checked Piazza more frequently just before an exam (27%) and those who relied upon Piazza rather evenly throughout the semester (38%).

The majority of students used Piazza to read posts left by other students. A much smaller fraction of students were actually posting (19%), which implied that there was a substantial amount of reading of posts which might be construed as lurking.

The reasons for using Piazza are mixed. More than 87% of respondents used Piazza to gain information about lab assignments at least once a week while 79% used the site more than once a week to gain information about conceptual questions and 75% reported using it to clarify administrative details.

Students attached substantial value on the availability and the use of Piazza in BI
The single item that students identified as the most valuable asset of Piazza was the ability to read posts left by other students. Accessibility is certainly an important component of being able to read posts left by other students. Students spoke about accessibility from two different perspectives. The students really appreciated having access to Piazza 24 hours a day/7 days a week. They cited enjoying the fact that they did not need to leave their dorm rooms to get questions answered nor did they risk disturbing anyone at 2:00 am when they were grappling with a difficult question, they could just go online to Piazza and see if anyone had already posted the question or they were able to post the question themselves. More than 85% of students reported that Piazza helped them to learn by reading what others have posted. Students additionally reported that they found explanations left by other students helpful because the information was more approachable and generally explained in simpler terms.

Other factors cited by students regarding the value of using Piazza in their study of biology include responding to questions so that students could test their own knowledge and the creation of a virtual community where students can easily interact.

Students thought that Piazza offered them an efficient mode of communication with their classmates and a perception of increased connectedness. Student’s perception of the Piazza site was that it was student run and student driven and that all students participated with a unity of purpose. In the survey and in interviews, students felt that the Piazza site helped to foster a sense of community and that it helped them to connect with their classmates and facilitated learning from their peers. Students reported that they felt a sense of ownership with the site. Students also appreciated the anonymous aspect of the
postings as it provided an aspect of safety. It seemed that Piazza provided a risk-free environment where even the shiest or the most insecure of students could go for help.

When asked what were the characteristics of students who would benefit the most from using Piazza, most of the students indicated that it was an ideal platform for students who were shy or who might not be well connected to classmates. Some students reported that that in order for Piazza to be successful, the participation of many students was essential. Piazza provided a means for students to take charge of their own learning in a risk free environment.

The data suggested that most of the students agreed that the Piazza site was primarily student run. This made me curious about whether the role of the instructor had changed in the view of the student and in the view of the instructors. I did not find that this was the case. Students prevailed in the view that the instructors were the purveyors of the content and faculty did not feel that their role had changed. Additionally the course instructors encouraged peer interaction on the Piazza site. Instructors voiced the view that students should ask questions of each other so that they could provide to each other a resource and that the many benefits of peer teaching can be realized.

A discussion of the findings with recommendations will follow in Chapter 5.
CHAPTER 5. DISCUSSION

Overview of the Study

This study examined the use of a social media tool called Piazza as it is used in a large undergraduate, face-to-face biology class. Multiple data sources were triangulated to ascertain recurrent themes and to validate results. These data sources included an online survey administered to all students enrolled in the class and interviews with thirty participants, including 27 students, one student-to-student tutor, the course director and one of the content instructors for the class. Metadata was collected from the Piazza site itself. Additionally, coded transcripts of the actual postings on the Piazza site were analyzed and field notes were taken over the course of spring semester 2014. The research questions explored are as follows:

1. How are students using the social media tool Piazza in their study of biology?

2. What do students perceive as the value added of using Piazza in their study of biology?

3. How does Piazza affect the creation of a community?

Overview of the Results

This study identified four major themes which included 49 major categories and subcategories from the data. The major themes that emerged in this study are:

Access to information

Motivation

Development of Community of Learning

Respect and safety
In survey responses and in interviews, students primarily used Piazza as an information resource to get help with their biology studies. As compared to all interactive biology resources, more than half of the survey respondents ranked Piazza as either an extremely or very important resource in their study of biology (Table 4.3). Specifically regarding clarification of biological concept questions, 97% percent of the survey respondents indicated that they read other students’ posts on Piazza at least once a week with 62% reading posts more than four times a week (Table 4.4). More than 70% of survey respondents indicated that the ability to read questions and responses left by other students was the single most valuable aspect of the Piazza site (Figure 4.7). As reported in survey text responses and in interview, students explicitly pursued information based on what information they needed and when they needed it. There was little difference in how the students used this resource for conceptual questions versus logistical questions. They valued having this resource for its ease of access. Accessibility encompassed both the 24 hour accessibility as well as explanations explained by classmates at a peer level, which many students reported as more accessible to them. Students reported that Piazza helped to establish a community of learning through virtual communications in a very large face-to-face undergraduate class. This study is framed in a social cognitive framework in which students learned through interaction with others.

**Theme One-Access to Information**

Piazza provided 24/7 access for students to ask questions of other students and student-to-students tutors, the ability to check if their questions were already answered by other students in their class, and as ready source of information for students to check their
own understandings against those of their classmates. In survey text responses and in interviews, reflected in Chapter 4, students reported that they enjoyed the convenience of not having to leave their dorm rooms or the library to get to study groups or to office hours in order to get their questions answered in real time. They could check Piazza whenever their schedules allowed. This is important because students reported that they valued a resource that they could turn to for information regardless of the time of day. More than 94% of survey respondents indicated that rarely or never attended office hours and those interviewed indicated that often scheduled office hours were inconvenient or that the students were uncomfortable with potentially asking a faculty member what might be perceived as a stupid question.

Aaron: If anything, I think it is the easiness of getting an answer to a question without having to leave your dorm. You would not need to trek across campus to find out the answer to a question about how you should be transporting your data in the lab.

Dallas: Really just the accessibility… if I’m up late working on a lab or something and it’s like two in the morning or something, I can’t really email my professor and get an answer you know right away but I can always go to Piazza no matter what time and you know usually 90% of the time I’m able to find an answer or stumble upon something that leads me to the correct answer, so I think my favorite part about it would be just the accessibility and how it’s somewhat instantaneous.

Abby: I actually meant to go to office hours but I couldn’t make it because of another conflict. I have not been to the student to student review session because I thought that maybe the reading the textbook would be more effective for me to get the whole information because I have friends who went and they were, like, if you haven’t read that much of the textbook, you should not go to the student to student study section. So I just read the textbook.

Instructor B: Nobody comes to office hours. I had more this year than I ever had. And I probably had a total of 10 visits. I said that these are my official office hours, but I am flexible to make appointments to accommodate your schedules. My door is usually open. A couple of people emailed me to make alternate office
hour arrangements. There was actually, much more interaction though Piazza than there were people coming to office hours.

Another facet of information access is the benefit of having questions answered by peers. As indicated in Table 4.7, more than 85% of survey respondents indicated that Piazza helped them to learn by reading what others have posted. As reported in Chapter 4, students thought that their peers provided explanations that were more accessible to other novice learners. Similar benefits were also reported in studies peer-to-peer learning advantages by Lockspeiser, O’Sullivan, Teherani and Muller (2008), Hughes (2011), and Chi, DeLeeuw, Chiu and La Vancher (1994). Like the findings reported by Lockspeiser et al. (2008), students in BI 108 reported the simplified explanations offered by their peers or student-to-student tutors provided information and explanations that were more cognitively accessible to them than explanations from content experts. This helped them to incorporate the content into their studying and gave them a starting point from which to further develop their understanding of the content.

Diana: By asking a peer a question or asking a peer for more information, it may provide you with the information that is more accessible and understandable to you. So sometimes, I have asked a professor a question and they are explaining it and I am not necessarily comprehending it because... I don’t know they may be smarter or they may be using terms that I do not necessarily know because they have been doing for so long. But if I ask a student who is doing well in the class, they may say ‘...well, why don’t you look at it this way’. A peer may be able to present it in a way that is way more simple and I am able to get it.

Survey respondent 73: Classmates post questions about concepts that sometimes I do not understand, and student responses tend to be better than the instructor's because the student responds in a way that is at my level rather than above it.

Survey respondent 74: People usually have the same questions I do, so it's helpful to see instructors answer those questions as well as students so you can get two
definitions and see which one sticks better with you. Sometimes it's easier to read student responses because it's worded in a way that's more easily understood.

Also as Lockspeiser, O’Sullivan, et.al (2008) and Webb’s (1982) reported, students in this study stated that the process of explaining a problem to another student actually assisted the helper student in the learning process. Interacting with peer students by asking questions, teaching others and seeing how others are learning all can lead to improved learning (Stahl, Koschmann, & Suthers, 2006).

**Recommendations:**

**Greater access for teaching assistants:**

Laboratory teaching assistants should be asked to participate on Piazza. When asked about the types of resources that students searched for on Piazza, 87% of the survey participants indicated that they searched for assistance with laboratory related questions at least once a week (Table 4.6). Additionally in open response text-based questions when students were asked how Piazza can be improved, 18 participants recommended that the Piazza site should be organized to separate laboratory sections or that the laboratory teaching assistants should participate in the Piazza site in order to respond to questions related to laboratory reports. These data support the idea that students could use additional support for laboratory assignments The participation of teaching assistants would provide a helpful resource in answering questions related to the laboratory and the preparation of reports.

**Predictable hours for faculty responses:**

Given the dearth responses from course instructors, 35% of students who responded to the survey question about how Piazza could be improved, indicated that
they would appreciate the occasional participation in Piazza from course instructors. Some students indicated that they did not always trust the responses of their classmates and that they would welcome course instructors entering the online discussion to clarify topics or simply to endorse answers that other students had posted.

Additionally the course director, the content instructor and the student-to-student tutor who were interviewed, reported that very few students attended face-to-face office hours. Sixty-two percent of survey respondents indicated they never went to office hours while 32% students reported in survey responses that they rarely attended office hours (less than 4 times per week, Table 4.4), for various reasons, including scheduling conflicts and anxiety about meeting one-on-one with professors. These data are further documented by excerpts from interview transcripts in Chapter 4. In terms of these data, it is my recommendation that the department should consider holding live, online, office hours for students. This would commit faculty to being online to answer questions for students who cannot make it to a professor’s office. Using Piazza for online office hours would have the added advantage that more than one or two students can benefit from the interaction. Additionally, the questions and responses are documented in an enduring transcript, so students who were not able to be online during a synchronous session could benefit from the instructor’s participation. In the interest of peer-to-peer learning and the formation of a cohesive community of learning, I recommend that the professor’s live participation actually be intentionally limited to encourage peer learning, and in doing so, support more active learning for the individual.
Daily forums:

It may be helpful for either the content instructor or the student-to-student tutors to post a question or an idea from lecture on a daily basis. There is data that supports this recommendation. The Piazza site metadata documented that 95% of the students enrolled had spent some time reading Piazza posts and more than half of the class had viewed at least 50 posts. More than half of the survey respondents ranked Piazza as very important in their study of biology (Table 4.3). As shown in Figure 4.6, nearly 89% percent of the survey participants reported using Piazza at least one time per week to help in their study of biology with 38% of respondents indicating that they were using Piazza on a consistent basis throughout the semester (Figure 4.7). With regard to biological concept questions, specifically, 97% percent of the survey respondents indicated that they read other students’ posts on Piazza at least once a week (Table 4.4). Based on these data it is clear that students are spending time engaging on the site. There were 246 instances in the survey in-text responses where students cited how Piazza helped them to learn biology contributing to the common theme of access to information and reflection on course content. These data are further supported by the excerpts of interview data presented in Chapter 4.

Based on feedback from the students in survey responses and in interviews, it may be helpful for student-to-student tutors to post a question or an idea from lecture on a daily basis. In interview and survey responses, students reported that they had entirely missed key points in lecture by “zoning out” and that postings on Piazza had made them aware that they had missed something providing them with the opportunity to learn about
it. In providing a short post with a few key points from lecture or a single prompt based on the lecture of the day, tutors would encourage students to reflect upon lecture (however long or brief) and potentially inspire students to respond to the post online, whether collaboratively with all classmates or internally for only their own benefit.

Piazza provided students an additional asset to engage with content that needed to be reinforced or material that they had entirely missed during lecture. It is important that Piazza not be looked upon as a substitute for attending class. During my interview with the only content professor who actually posted on Piazza, he indicated that he could recognize that some students who posted, by virtue of their question phrasing, had not actually been in class.

Instructor B: The (Piazza) site looked okay, I mean, some of the questions were stupid. You could tell that they hadn’t been in class and they had no idea of what was going on.

Clearer training of students:

There were ten survey text responses that suggested that students had not received sufficient training in how Piazza worked. In addition, thought interviews and observations, I believe that this number may be much higher. Some students complained about being overwhelmed by the number of email notifications and reported being unaware that they could modify the number of alerts. The following is what some students suggested for improvements to Piazza.

Survey Participant 63: (Piazza can be improved by) be(ing) able to set the email alerts to every other day instead of daily.

Survey Participant 93: (Piazza can be improved by) remov(ing) email updates from Piazza. Make folders for different biology sections. When an instructor posts differentiate that from an LA (student assistant).
Other students indicated that they found it hard to find the information that they were looking for and seemed confused how to use the search function.

Survey Participant 81: (Need) a more user friendly interface

The class could benefit from a required tutorial on how to use this resource. This might be a component of a lab session and augmented by a small, short term assignment which would require students to use Piazza. Potentially improved orientation could lead to greater student participation.

**Organization of Resources:**

In addition to instructing students about how the Piazza site worked, future classes would benefit from better organization of the Piazza site itself. As reported in Chapter 4, students reported confusion about how to find information on the site.

Survey participant 185: (Need) folders that organize topics based on topic instead of time posted. Perhaps just have separate categories with labels and all of the relevant posts go in that category instead of on one main one. Ex: all lab questions are posted together while all lecture questions are posted in a different place. Nothing too specific, or questions could get lost in the shuffle, but it would be valuable if you are, say, looking for help on a lab specifically. Then you wouldn't have to sift through all of the lecture questions looking for relevant posts.

Survey participant 247: There should be a better way to categorize questions. Having separate sections of Piazza for lab, lecture, and administrative questions would be helpful.

Better use of the Piazza functions may make the use of the site more appealing for users. For example the use of folders on the site either by content area or by lecture/lab areas may encourage the increased use of the site by a broader segment of class.
Theme Two-Motivation

Like users of other content creation sites such as Wikipedia, students tended to use Piazza primarily for their own personal advantage. Fraser and Dutta would describe Piazza as a rational, opportunistic network (2008). Students were primarily using Piazza for their own personal advantage and for what they each were able to take away from it individually. Similar to the Gesellschaft (Fraser & Dutta, 2008), students were happy to contribute to a community of learning however they were primarily participating to enhance their own personal learning and preparation. To the extent that students were choosing of their own volition to participate in the Piazza site is a function of their personal self-efficacy, self-regulation and ultimately their learning (Bandura, 1986). Searching for and finding additional information to support content understanding is indicative of increasing student self-regulation as students explicitly pursue their information needs.

As stated in Chapter 4, students reported that they felt their participation in Piazza contributed to the creation of a class community.

Erin: I definitely think it’s a community of learning, definitely, because even when its people I just met we would talk about Piazza, like ‘did you see that post about this and that’ and like ‘oh yeah I saw that it’s like this and that’. And last year we would talk about Piazza a lot just because questions in chemistry, I personally think, were more difficult than in bio so we would just discuss what questions were put up there and stuff like that. So it’s definitely a community. My friends use it a lot. We love it.

Instructor W: Yes, it (Piazza) absolutely contributes to a learning community. It give the students a forum where everybody gets the same experience. It is actually an interesting distinction between the whole collaboration piece but still being part of a learning community.
Dylan: (Piazza) added a sense of community too just because ‘hey we’re all in this together’.

Although the students participated to different degrees, the students reported that the student community was driving the Piazza discussions and overall the students felt ownership of the Piazza site. Student opinions regarding faculty participation and required student participation were mixed. While students favored the occasional extra credit opportunity, they overall felt that mandatory participation would dilute the rigor of the student questions and responses and may lead to perfunctory participation.

Dena: If it was made mandatory: it would be ok especially if it was going to help your grade. It might change the integrity of the post because the focus of posting would be on the grade. People would feel pressured to post on Piazza so it might not be thoughtful, it might just be something for a grade. That might change how Piazza is used.

Erin: If participation was required, that means that there is no anonymity, right? Because it would be graded? I think there would be a lot of questions that are unnecessary to be on there. I know plenty of people who would just post random questions that they may already know the answers to and that aren’t very thoughtful or thought out. So like, instead of asking the details of Glycolysis they would just ask ‘what is Glycolysis’ which is easy, it’s like glucose to pyruvates. It would be questions like that, so I don’t think it should be necessary, just because it would be less of a learning experience and more of a free-for-all for everyone to post random things.

Meaningful contributions to the class community would be therefore less likely to take place.

**Recommendations:**

I recommend that the course director design an introductory Piazza assignment with the goal for students to learn how to use the site and not to be intimidated by it. They should learn how to control the email alert functions and course director should set up
easier to understand tabs within Piazza to make the organization of the content easier such that it is easier to locate posted questions. By having a single required tutorial or assignment, it would encourage the students to learn about how the site may contribute to their learning and those who have sufficient self-efficacy and self-regulation would be more likely to use it if they are not intimidated by the interface of the Piazza site itself.

**Theme Three-Community of Learning**

Wegner et al. (2002) described a community of practice as groups of people who share common problems or interests and who broaden their understanding through interacting with others in the community. While students did report using Piazza primarily for the enhancement of their own knowledge there clearly was sense of community amongst Piazza users. When survey participants were asked how Piazza helped them to learn, more than 50% reported that Piazza allowed them the opportunity to ask questions of their class community and 47% reported that Piazza provided a virtual community where students can easily interact. The response from text entries and from interview responses were more compelling as students reflected upon the benefits of learning from their classmate and how Piazza facilitated that communication.

Instructor W summed up community aspect of Piazza in the following way:

Instructor W: Yes, it (Piazza) absolutely contributes to a learning community. It gives the students a forum where everybody gets the same experience. It is actually an interesting distinction between the whole collaboration piece but still being part of a learning community.

Additionally students cited a feeling of *esprit de corps* with their classmates and reported in interviews and survey text responses that the participation on Piazza promoted a unity of purpose.
Dena: (It was) more of a team effort, more of we are all working together to pass this class. We all helped each other.

Dylan: (Piazza) added a sense of community too just because ‘hey we’re all in this together’.

Similar to Gunawardena et al. (2009), I found that the social media tool, Piazza helped to build community though dialogue and interaction. The process of students having the opportunity to explore each other’s understanding led to a mutual understanding (Gunawardena, Hermans, Sanchez, Richmond, Bohley, & Tuttle, 2009). In practice, members of this community participate in the domain such that they are practitioners that share common practices, experiences and ways of thinking. (Wenger E., 2015). Additionally the community of practice model accommodates peripheral and tangential participation which was certainly part of the BI 108 practice of using Piazza. A key ingredient of a community of practice is that learners must perceive themselves to be members of the community in which experts participate and the community has to accommodate legitimate peripheral participation (Hoadley C., 2012). Hoadly (2012) uses the expressions of community of practice and knowledge building community interchangeably. Gunawardena et al. (2009) suggest that when member of a community are using Web 2.0 tools for communicating, that a shift in cultural norms may be taking place such that the tools may be causing a change in the way that participants are thinking and their ways of approaching the task. Gunawardena et al. (2009) goes further to propose that social media tools are changing how we learn and how we interact with each other.
Hoadley (2012), reminds us that communities of practice are often informal with a high level of identification to a particular group. The Piazza site for Biology 108 certainly fits these criteria. Educational designers are able to support communities of practice by enhancing ease of communication and allowing for peripheral participation (Hoadley C., 2012). Piazza is a platform which allows for peripheral participation. Students reported that the information exchange on the Piazza site accommodated those who wanted to visibly and actively participate but also those who preferred a more invisible or peripheral participation. Taken from the actual site metadata, I found that 95% percent of all the enrolled students had spent some time reading posts, while only 51% making one or more contributions. This is certainly consistent with the concept of peripheral participation. Many of the students reported that they did not feel the need to post, because frequently when they turned to Piazza for the solution to a problem, they already found the question and answer already posted.

Neva, I mainly use it, if I have a question, I will look on Piazza to see if somebody has already asked it and if it has been answered. Because a lot of times, I can find it there. If it is not on there (Piazza), I’ll look through some other resources to see if it is in the notes or in the reading, and then if I still can’t find it, then I will post a question.

Survey respondent 171: It gives easy access to communication with the rest of the class and reassures my knowledge.

Aaron: Most of the time I read what people have posted and how they have responded. I have asked a few questions in the past. I have tried to answer the questions but sometimes the questions that I could answer have already been answered.

Some might refer to this behavior as lurking, an expression fraught with negative connotations (Beaudoin, 2002; Dennen, 2008; Preece, Nonnecke, &
Andrews, 2004). Similar to the data collected by Beaudoin and Dennen, students participating in this study reported that non-posting participation such as post reading was valuable in an individual’s learning.

Survey Participant 21: Using Piazza is extremely beneficial in learning biology because it helps me understand topics and ideas that I would have not understood otherwise by myself. Sometimes going to office hours doesn’t help and so I use Piazza to understand material.

Katia: Well I didn’t ever really post in it, but would read questions ‘cause a lot of questions people posted were sort of things that everyone wanted to know.

Sarah: I mean, I don’t post as many questions or posts or anything like that and that’s generally because with such large classes someone has already posted the question I have so it’s nice to go through if I have anything I don’t know or anything that I can figure out then I can usually go on there and find the answers that I need.

What tends to be overlooked in asynchronous virtual environments are other factors that may be contributing to a student’s learning (Beaudoin, 2002). Further Beaudoin (2002) reminds us that learning using technology-based media is largely self-regulated and often invisible.

**Recommendations:**

**Formation of study groups:**

Some students chose to post requests for face-to-face study groups. There was a regular face-to-face study group that met in one of the residence halls. This group was recruited through the Piazza site and they met regularly though the semester. Students could choose to attend any of the meetings or just when they felt that they wanted to connect with a classmate face-to-face.
With this in mind, there may be some merit in students organizing online study groups through the Piazza site. Students from different parts of campus could sign up for either synchronous or asynchronous study groups to work exclusively on laboratories or even on particular content areas such as respiration, or photosynthesis.

**Theme Four-Respect and Safety**

Nearly 100% of those interviewed indicted that valued the fact that they were able to post questions and answers anonymously. It provided a sense of safety where they could risk asking what might be perceived by some as “stupid” questions without anyone knowing who actually asked. Additionally three survey respondents volunteered that the anonymity factor enhanced the value of Piazza in the study of biology.

Survey Participant 243: I am able to post anonymously so that I am not embarrassed to ask a question that I might have been embarrassed to ask in lecture.

Abby: There is a great deal of value from learning from your peers but the fact that a lot of people post anonymously on the site gets rid of the scary feeling that you might be asking a stupid question.

David (student-to-student tutor): I kind of wish that (Piazza was more open), I know that a lot of students are going to want to be anonymous but if that wasn’t an issue I think it would be really interesting to have students have their own like kind of page and if they want to they can update their profile and… I don’t know just, it would be cool ‘cause you’re not just anymore just posing a question, having a random person answer it and moving on, you might say ’oh, like this is Mike, I might make sure to thank him when I’m in person with him’ so I think it gives the opportunity to say like ‘oh like’ get to know the person that you’re actually talking to. And that might lend itself to some kind of conversation in person next time you see the person.

Instructor W: I also think that it is important to recognize that the students want to be anonymous. I do think that if there is a completely egregious post, something really outlandish, something that I did want to follow up on, then I would track it
down; never felt the need to drill down to see if you could find out who posted anonymously.

David, (student-to-student tutor): So, I guess the ones that were anonymous to students and not the instructor might be thinking ‘well I don’t want to seem like someone that’s so active in this participation’ you know, like it’s not that it’s a negative thing but someone might not want to be seen as someone that’s constantly on Piazza, answering questions, asking questions by the students. But they want their faculty to see that there’s an effort being made in case there’s a dispute with their grade or they feel like they might not get the best grade. They want to hope that ‘maybe the faculty will see that I tried very hard.’ And those that want to stay anonymous overall, I don’t know if they’re just embarrassed that they might be asking a question they think is dumb, and of course we know there’s no dumb questions but they might think that their question is… ‘I don’t know if this has been answered a millions times so I’ll just leave myself anonymous’.

As reported in Chapter 4, instructors and students did report that they on occasion found that postings were disrespectful either in content or in tone.

Survey Respondent 7: (Piazza can be improved) by having students complain less and by being less passive aggressive with one another.

Survey Respondent 86: The students should be told to stay more professional.

Instructor W: I have had, this past spring, a student come in and say, ‘you know, somebody posted a reply and I felt it was very rude’.

While some students felt intimidated by such postings, it is the fact that the postings were anonymous that many students feel safe to post.

**Recommendations:**

The default posting function in Piazza was to post anonymously, and though my interviews, I found that either students did not often remember to actively change the default so that their names would be reflected or chose not to do so. The risk of anonymous postings, of course, is that it provides a cloak of invisibility to those who
wanted to post terse or mean responses. Students who are taking a risk by posting at all do not need the thinly veiled negative remarks about their questions or their cognitive abilities.

**Implications of the Results for Theory, Research and Practice and Suggestions for Further Research**

This study presents an interesting dichotomy in terms of the learning community. The face-to-face aspect of the class, one might argue provides a sense of community however through my interviews I found that students did not report a sense of community in the lecture hall. The comments that I heard about lecture included comments about the sheer magnitude of the class enrollment and being a face in the crowd. Further, students did not feel that they had the opportunity to ask questions within the lecture hall and with few exceptions, really did not know many of their classmates. I would be interested in exploring in greater detail how the community of learning differs between the face-to-face lecture hall and the virtual environment of Piazza. What are the advantages and disadvantages of each for teaching and learning?

Much research on discussion forums has focused on content analysis primarily using the entire message as the unit of analysis. This study much like those of Arnold and Paulus (2010) and Beaudoin (2002) in that it raised questions about the learning taking place that was not evidenced in the discussion transcript. Future research trying to understand this possible hidden learning is recommended and may involve observations of actual use and immediate interviews as well as computationally based data mining techniques or neuroscience based eye tracking technologies.
In this study, I also asked questions about the shifting of the instructor role within the largely student run virtual community. I feel that this area warrants further research and it might be interesting to determine via an experimental design if having the instructors post regularly makes any difference in how students value their experience with Piazza.

It would also be interesting to study the use of Piazza in a class with only one instructor. The fact that BI 108 had two very different content professors may have had an influence on how the students chose to use the social media tool.

An element, with which I struggled, was the exact category of social media in which Piazza fit. The literature often was conflicted about social media, social networks and social networking. The functionality of Piazza is more like a wiki in that it accommodates user created content without the primary intention to connect socially. While one may argue since the Piazza technology could support the creation of a semi-public profile, Piazza was not used in this way in BI 108. Additionally, most of the students participated anonymously. I am curious if the creation of profiles in the context of the biology class might influence how it is used, if students will still elect to primarily post anonymously, and if that will have any bearing on the frequency and quality of student postings or on peripheral participation.

Lastly, it is important to remember that Piazza was chosen because it was already in use at Boston University. It may not be the best tool for this sort of interaction and there may be others that better support student interaction and communication.
Summary

This study contributes to the conversation regarding the use of Web 2.0 tools in augmenting face-to-face instruction. Students in the 21st century have become highly connected to information and to each other via technology (Selwyn, 2012). Users of social media have the access to information whenever they need it and the technology affords them the opportunity to access that information based on their individual needs and schedule demands. Selwyn (2012) further suggests that social media may support users taking a more active role in their learning, not only what content they consume but also how and when they do so. This view presents new challenges for colleges and universities to accommodate these modes of greater student autonomy.

Students reported that they valued the Piazza social media site because it allowed them to easily interact with classmates, to anonymously post questions and responses in a relatively risk-free, virtual environment. Further, while most of the students posted anonymously, the students still reported a strong sense of community although not a true sense of collaboration. Students took from the interactions what they individually needed even if it was a different way of looking at content, or finding out how a lab report needed to be formatted while still maintaining a sense of “being in this together”. Social media allows for interactivity and content creation although students in this study participated primarily as observers or as Selwyn (2012) refers to as free-riders on the work of others.

The results of this study suggest further research exploring differences between the community of practice created virtually and that which may exist in the large face-to-
face class. The invisible learning of lurkers was one of the most fascinating aspects of these data. The struggle between anonymous posting, invisible reading and the widely accepted view that learning must be visible to be valuable provides interesting prospects for new views about the role of social media tools in augmenting face-to-face classes. Traditional formats of course delivery may benefit from an informed perspective on how many students now acquire information, and synthesize knowledge. It is incumbent on educators to find innovate ways to use newer technologies in support of student learning while being careful not to adopt technologies simply because they are new and available. Earlier technologies such as film, radio, and television largely failed in their integration with education because enthusiastic adoption was not tempered with grounded research (Cuban, 1986; Saettler, 1990). It is our obligation, as educators, to approach the integration of social media into face-to-face classes in a thoughtful and informed manner.
APPENDIX I- STATEMENT OF SUPPORT

Boston University College of Arts & Sciences
5 Cummington Mall
Boston, Massachusetts 02215
T 617-353-2432  F 617-353-6340
www.bu.edu/biology

January 21, 2014

To Whom It May Concern:

As the coordinator of Principles of Biology II (CAS BI108), I have worked with Sandi Grasso in the design of her study investigating online collaboration in freshman at Boston University through the online discussion board, Piazza. I support her experimental approach and the inclusion of the BI108 student population in online surveys or in-person interviews. The metadata regarding usage and posting frequency on Piazza will also be analyzed.

The evolution of Web 2.0 technologies has opened the door to new ways to share and understand complex concepts. It will be interesting to see how our students are using these new technologies to take charge of their own learning.

Sincerely,

[Signature]

Kathryn E. Spilios, Ph.D.
Instructional Laboratories Director
Boston University, Biology
5 Cummington Mall
Boston, MA 02215
617-358-1958
kspilios@bu.edu
APPENDIX II- ONLINE CONSENT FORM AND STUDENT SURVEY

RESEARCH CONSENT FORM
Online Survey Consent Form
Title of Project: Student Use of Piazza Online Discussion in an Introductory Biology Class.
Principal Investigator: SandraJean Grasso

Study Background:
You are invited to participate in a research study titled Student Use of Piazza Online Discussion in an Introductory Biology Class. This study is being done by SandraJean Grasso, Doctoral Student from Boston University, School of Education. You were selected to participate in this study because you are enrolled in BI 108 in Spring term 2014.

Purpose:
The purpose of this research study is to study if and how students are using Piazza to assist them in learning biology in this class. What value students perceive from participating in Piazza. We hope that your participation in the study may help to better define how technology can assist with the instruction and learning of biology especially in introductory classes.

Procedures:
If you agree to take part in this study, you will be asked to complete an online survey/questionnaire. This survey/questionnaire will ask about how you use technology in school and socially. It will take you approximately 10 minutes to complete.

Risks and Discomforts:
We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. We will minimize any risks by anonymizing the data. All data will be stored in a password protected electronic format. To help protect your confidentiality, the surveys will not contain information that will personally identify you. The results of this study will be used for scholarly purposes only. Subjects will be anonymous and unidentifiable. You may choose not to be in the study or to stop being in the study before it is over at any time. This will not affect your class standing or your grades at Boston University. You will not be offered or receive any special consideration if you take part in this research study.

Benefits:
No direct benefits beyond participating in the enhancement of future biology classes.

Alternatives:
Your participation in this study is completely voluntary and you can withdraw at any time.

Costs/ Payments:
You will be given a $5 Amazon gift card to thank you for your participation

Confidentiality:
All data will be stored in a password protected electronic format. To help protect your confidentiality, the surveys will not contain information that will personally identify you. The results of this study will be used for scholarly purposes only. Subjects will be anonymous and unidentifiable.

If you have questions about this project or if you have a research-related problem, you may contact the researcher(s), SandraJean Grasso at 978-697-0759, sgrasso@bu.edu and/or Bruce Fraser at 617-353-3234, bfraser@bu.edu. If you have any questions concerning your rights as a research subject, you may contact the IRB office at Boston University) at 617-353-6115 or irb@bu.edu.
By clicking “I agree” below you are indicating that you are at least 18 years old, have read and understood this consent form and agree to participate in this research study.

- I agree
- I Do Not Agree

Block 2

Please select the best answer.

What is your age? We may only survey students 18 years and older. Respondents under 18 must exit the survey.

- 18-20 years old
- 21-23 years old
- 24-26 years old
- More than 26 years old.

The next few questions will ask about your use of technology.

What type of electronic device(s) do you own and use every day? Select all that apply.

- Smart phone
- Desktop Computer
- Laptop Computer
- Tablet

Do you have a profile in any of the following? Select as many as apply.

- Facebook
- Twitter
- YouTube
- Google+
- Other, please indicate other social media you use.

[unctional text field]
<table>
<thead>
<tr>
<th>Activity</th>
<th>Everyday</th>
<th>5 or 6 times a week</th>
<th>3 or 4 times a week</th>
<th>1 or 2 times a week</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion Board/online forums</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facebook</td>
<td></td>
<td></td>
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<tr>
<td>Google+</td>
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<td>Blogs</td>
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<tr>
<td>Podcasts</td>
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</tr>
<tr>
<td>Flickr/photo-sharing sites</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Twitter</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>SecondLife</td>
<td></td>
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<tr>
<td>YouTube</td>
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<tr>
<td>Pinterest</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

The next few questions will ask about your use of technology in your education.
Have you ever created any of the following?

<table>
<thead>
<tr>
<th></th>
<th>Yes for a class</th>
<th>Yes, but not for a class</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>A website</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>A blog</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>A wiki</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>A podcast</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>A discussion post</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>An electronic portfolio</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Have you ever used any of the following in an educational context such as participating in a study group, or to collaborate in a project? Select as many as apply.

- [ ] Facebook
- [ ] A wiki
- [ ] A blog
- [ ] Video over internet such as Skype.
- [ ] Texting from a mobile phone.
- [ ] Google Drive or Google Doc
- [ ] Online video
- [ ] Other Interactive technology
Please elaborate on how you used the technologies above in an educational context. Please describe how they were used and whether they were beneficial to you.

Excluding Piazza, have you used online discussion forums for academic course work (for example in Blackboard)?

☐ Yes
☐ No

Are you currently enrolled in BI 108?

☐ Yes, I am currently enrolled in BI 108.
☐ No, I am no longer enrolled in BI 108.

In an average week this term, how often do you use the following to help you study for biology class?

<table>
<thead>
<tr>
<th></th>
<th>Everyday</th>
<th>5 or 6 times a week</th>
<th>3 or 4 times a week</th>
<th>1 or 2 times a week</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Text messaging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instant messaging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twitter</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Facebook</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piazza</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LinkedIn</td>
<td></td>
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<td></td>
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<tr>
<td>Other social networking sites</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Voice and/or video over internet services such as Skype</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Face-to-face interaction</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Learning Management Systems such as Blackboard.</td>
<td></td>
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</tr>
</tbody>
</table>
How important are the following to your successful study of biology?

<table>
<thead>
<tr>
<th></th>
<th>Extremely Important</th>
<th>Very Important</th>
<th>Neither Important nor Unimportant</th>
<th>Very Unimportant</th>
<th>Not at all Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor lectures</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Instructor office hours</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Help from teaching fellows</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Help from learning assistants</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Using Piazza</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Face-to-face study groups</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
</tr>
</tbody>
</table>

The next few questions will ask you about how you use Piazza in Biology.

In an average week in BI 108, if you had questions about the biological concepts (for example-cellular respiration) how frequently have you used the following for help?

- Posted on Piazza
- Read other students’ posts on Piazza
- Went to office hours
- Attended review sessions with learning assistants
- Emailed instructors
- Asked Teaching Fellows during laboratories
- Tried to find the answer online.
- Got together informally with classmates for face-to-face study group.

Have you ever used Piazza in a class prior to enrollment in BI 108?

- Yes, Please specify in which class(es) you used Piazza
  
- No
Do you use Piazza for BI 108?

- Yes
- No

**Please list the reasons that you do not use Piazza.**

**The next few questions ask about how you use Piazza get help to clarify biology questions. This can mean asking a question that you don't understand about a topic, or asking for help on a homework problem or getting help with a topic for an exam.**

**How do you use Piazza most often?**

- Post questions
- Post responses
- Reading questions and responses
- All the above

**How often do you use Piazza in BI 108 to get help with the following type of questions?**

<table>
<thead>
<tr>
<th>Type of Question</th>
<th>Daily</th>
<th>5 or 6 times a week</th>
<th>3 or 4 times a week</th>
<th>2 or 3 times a week</th>
<th>Once a week</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questions about biology concept questions from class</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrative or mechanical questions like how to format reports</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Checking of homework due dates or exam dates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questions about lab</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
How does Piazza help you in your study of biology? Select as many as apply.

☐ It allows me to ask questions of my class community.
☐ It allows me to test my own knowledge by posting responses to posted questions.
☐ It allows me to learn by reading what others have posted.
☐ It allows me to learn by reading what instructors have posted.
☐ It provides a virtual community where students can interact easily.
☐ It makes the class seem smaller because students are able to exchange ideas through Piazza.
☐ I am able to check on important administrative details such as exam dates or report format questions.
☐ It helps me in other ways, please indicate in the text box.

☐ Piazza does not help in my study of biology.

How does Piazza help you to learn biology?

In general terms, how would you describe the frequency of your use of Piazza.

☐ Equally throughout the semester.
☐ Only when I do not understand something in class.
☐ More frequently just before a major exam.

When you use Piazza, which single item of the following do you find the most valuable in your learning?

☐ Reading posts by other students.
☐ Responding to questions posted by students.
☐ Only reading posts left by instructors.
Please share three ways that the use of Piazza in biology can be improved.

You are

- An undergraduate freshman
- An undergraduate sophomore
- An undergraduate junior
- An undergraduate senior
- A graduate student. If so, which year?
- A non-degree student

What is your major or your intended major?

If you were enrolled in BI 107, in what was your letter grade at the conclusion of the class?

- A
- A-
- B+
- B
- B-
- C+
- C
- C-
- D+
- D
- D-
- I would rather not say
- I was not enrolled in BI 107
Based on your performance as of today, what letter grade do you anticipate receiving in BI 108 at the end of Spring term?

- [ ] A
- [ ] A-
- [ ] B+
- [ ] B
- [ ] B-
- [ ] C+
- [ ] C
- [ ] C-
- [ ] D+
- [ ] D
- [ ] D-
- [ ] I would rather not say

Gender?

- [ ] Male
- [ ] Female

What is your native language?


Block 4

Thank you for taking the survey. Please wait for a moment as the next screen loads so that you can enter your BU email address and name in order to receive your gift card. The survey information is anonymous and independent of the information that you will provide to receive the gift card.
APPENDIX III- STUDENT INTERVIEW GUIDE

1. How are students using Piazza to take charge of their own learning?
2. In which ways, if any, do they feel using Piazza broadens the learning community for Biology 107? Perhaps tie into the social presence theory.
3. Do students believe that they are using Piazza in cooperation with their peers or are they participating to enhance their learning as individuals?
4. How do the students rate the value to their learning of the discussion format? Using a Likert Scale survey can they assess the following:
   a. How do students rate the value to their learning of reading the instructor’s responses to student questions?
   b. Do the students find any one section of the discussion more valuable than another with regard to their own learning? On Piazza, the questions can be organized into different sections by area so for example you can separate the questions related to the lecture from the questions related to the laboratory.
5. Does the student post questions for the community?
   a. How often they post questions?
6. Does the student post questions solely for the instructor?
7. Does the student post responses to other student questions?
   a. How often do they post responses to other students questions?
8. How often does the student simply read what has been posted?
9. If the student does not access the site, what are some of the reasons that they do not?
10. Accessing the site. How often does the student log onto the site in a week, in a month. (some students may log-on more frequently closer to an exam date)?
11. Rating the value of this virtual learning environment.
   a. How does the student rate the value to their learning as related to instructor participation in discussion?
   b. How does the student rate the value to their learning as related to other students posting questions?
   c. How does the student rate the value to their learning as related to their own postings of questions?
   d. How does the student rate the value to their learning as related to their providing responses to the questions of others?
   e. How does the student rate the value to their learning of reading others responses to questions?
12. What are the other technologies that student is using to collaborate in the biology class?
   a. Google docs, Google Groups, Facebook, Twitter, wikis, text, other technologies?
13. How is the student organizing themselves in their learning?
14. Do the students feel that the role of the instructor shifted in light of the collaborative environment where students are able to answer questions for other students?
15. Does the instructor feel that their own role in the class has shifted in light of the collaborative environment where students are able to answer questions for other students?
16. Would student participation rate change if the instructor made participation required?
17. Would student participation rate change if they were being graded by the instructor based on their participation?
APPENDIX IV- INTERVIEW GUIDE FOR INSTRUCTORS

All questions were related to use of Piazza in BI 108. Questions were categorized into two groups:

- Observations of student use
- Instructor interaction on Piazza

Observations of Student Use:
- What are the three most important observations about how the students used the Piazza site?
- Do you think that Piazza is an efficient means of students collaborating with each other?
- In which ways (if any) do you think that Piazza contributes to the learning community of BI 108?
- Did you observe that the pattern of student interaction changed over the course of the semester and if so, in which way?
- What are the aspects of the Piazza site that you think are most successful and why?
- What are the aspects of the Piazza site that you think can be improved?
- Why do you think that some students post anonymously while others do not?
- From your point of view, tell me about the types of questions the students were asking on the Piazza site?
- How does the online Piazza discussion differ from the discussions that you have in the classroom?
- Do you feel that Piazza offers a different type of interaction than does takes place in the class?
- Did the complexity of the questions posted on Piazza change over the course of the semester?
- In the context of BI 108, where do you feel the most effective student to student interaction takes place?
- What are the advantages for the students who use Piazza?
- What type of student benefits the most from using Piazza?
- From your viewpoint, do you think that there is a relationship between interaction on Piazza and student outcomes?
Instructor Interaction on the Site:

- How often do you access the Piazza site?
- Explain how you use the site.
- How do you encourage interaction on the site?
- Do you ever post open ended questions on the site?
- Have you ever used Piazza for project based assignments?
- What would you think about making posting on Piazza mandatory for BI 108 students?
- What might enhance the use of Piazza to create a community?
- Do you think that the Piazza site would be more successful if someone was more actively moderating?
- If you could give students three pieces of advice about using Piazza, what would you say?
- Do you find since the launching of Piazza that the volume of your student email has changed?
- Do you think that Piazza has changed if students come to your office hours or otherwise ask you for help?
- What are the advantages for the faculty who use Piazza?
- Would you consider holding live online office hours through the chat function of Piazza?
- Do you or would you consider using Piazza to post content resources and links to additional content?
- Do you ever or would you consider assigning students the task of developing more fully online a point that was made in the face-to-face section?
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CURRICULUM VITAE

SANDRAJEAN M. GRASSO
152 Osgood Street
Andover, MA 01810
Sgrassso55@gmail.com
978-697-0759

Experience:

Boston University-Boston, MA-8/2007-present

Assistant Director- Graduate Program for Neuroscience – 9/2011-present

● Implement policy and strategic operations for the graduate neuroscience program. Participate in short and long-term planning for graduate neuroscience operations and activities including graduate student recruitment, orientation, advisement, academic and student services.

● Effective communications (including web management) with broad range of internal and external constituents including students and faculty. Development of technology applications that serve specific goals such as the development of electronic portfolios in support of seminar courses.

● Orchestrate recruitment of graduate neuroscience program students including representing the program at Graduate Student fairs including those sponsored at national conferences such as the Society for Neuroscience (SfN) and the Annual Biomedical Research Conference for Minority Students (ABRCMS).

● Manage operations budget.

● Advise current and incoming students, assist with registration questions and supervise advisement systems. Facilitate student support in their use of all departmental and university systems and processes.

● Communicate and coordinate with university offices regarding active students as needed (e.g., changes of grade, status changes, requests for withdrawal, monitoring electronic degree advising etc.).

● Organize student seminars and distinguished speaker seminars.
Program Administrator-Graduate Program in Neuroscience- 8/2007-9/2011

- Advise students about registration process, qualifying exam guidelines, and dissertation procedures.
- Compile applicant information for faculty admissions committee review.
- Plan and deliver all aspects of a three day cross campus recruitment event.
- Monitor budgets including an NIH training grant and a general operations budget.
- Assist in the preparation of institutional and NIH grants reports.
- Identified and initiated recruitment activities to attract underrepresented minorities.
- Coordinate seminars including travel and hospitality.

Independent Tutor – Andover, MA-1995-present

- Tutor high school students in biology, social studies, health and study skills contracting directly with the Andover Public Schools.
- Provide after school enrichment tutoring contracting directly with parents.

Massachusetts Community College System-2004-2007

Instructor

Middlesex Community College-Lowell MA.

North Shore Community College- Danvers, MA.

Northern Essex Community College-Haverhill, MA

- Taught Introduction to Biology, General Biology I and Anatomy and Physiology I.

Tutor

- Tutored Science in Middlesex Community College tutoring center.
Lesley University- Cambridge, MA-1987-1995

Director of Administrative Services-1992-1995

- Developed and delivered training for offsite administrative coordinators
- Monitored enrollments and retention trends.
- Planned and supervised all graduate school administrative services.
- Planned and supervised all Graduate School events.

Director of Off Campus Programs 1987-1992

- Supervised all administrative operations related to the delivery of courses at sixty off-site locations across the country.
- Performed initial review of admissions applications.
- Supervised course scheduling.
- Faculty communications.
- Supervision of budget- including travel, lodging and faculty payments.

Lesley University- Cambridge, MA-1987-1995

Instructor

- Developed and taught course in Health from the Perspective of Science and Social Policy. Also taught Individually Guided Studies in various biology areas to adult undergraduate students.

ODWIN Learning Center – Dorchester, MA

Instructor

- Taught General Biology, General Chemistry and Anatomy and Physiology to adult immigrant and minority students preparing to enter college level courses in the health professions. ODWIN is a post-secondary but pre-college learning center mainly servicing returning adults who need additional skills and training before attempting college level courses.
Education

- Boston University, Boston, MA
- EdD- Educational Media and Technology-2015.
- Wellesley College, Wellesley, MA.
- Institute for middle to upper level faculty and educational administrators on issues related to educational management.
- Lesley University, Cambridge, MA.
- Graduate coursework in education and management.
- Northeastern University, Boston, MA.-M.S.
- Merrimack College, North Andover, MA -B.A.

Presentations

Presentation for YMCA Education Program on “Thinking About College”.

Presentation on “Services to Support Diverse Graduate Student Groups” at Annual Meeting of the Northern Association of Graduate Schools