TO TWEET OR NOT TO TWEET: AN ANALYSIS OF THE EFFECT OF TWITTER ON SECONDARY STUDENT PERFORMANCE, ENGAGEMENT, AND ATTITUDES

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ABSTRACT

The purpose of this study was to determine the impact that using Twitter as an educational tool had on an upper level high school Sociology course. The research compared 2014 courses which used an online discussion board to 2015 courses which used Twitter for discussion. No significant differences in mean student grades were found between the two groups, suggesting that Twitter is a viable alternative to online discussion boards for blended learning. The research also compared student engagement between the two groups, and found a probable increase in student engagement through Twitter. In addition to these comparisons, a pre and post survey was given to the 2015 student group. The surveys showed a positive shift in perception of Twitter as an educational tool from the start of the class to the end.

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CHAPTER 1. INTRODUCTION

Early in the 21st century, we have seen a variety of changes regarding how people learn, access information and collaborate. These changes have been driven by a variety of factors, including cultural, political and demographic variables, to name a few. However, one could argue that, at least in the realm of education and learning, nothing has driven change as much as new technologies. Nearly a half century ago, Moore's Law identified that computer processing power doubles about every 18 months, enabling changes that will positively influence all learning domains but challenge humanity's ability to control technology (Bassoppo-Moyo, 2011). Additionally, as digital natives continue to populate our schools and our teaching ranks, schools will be under increasing pressure to include more 21st century methods and tools in the educational experience of students. One particular expression of modern life, technology and 21st century methods that is currently underutilized in schools is social media in general, and Twitter in particular.

The level of influence social media has in society as a whole is substantial and generally growing. While Facebook continues to be the most popular social media site with adults, claiming 71% of American adult internet users with accounts, other services saw significant increases in users from 2013 to 2014, while Facebook remained constant at 71%. Further, more than half (52%) of all internet users used two or more social networking sites, and Twitter usage increased by 6% in 18-29 year olds to 37% of total Americans (Duggan, Ellison, Lampe, Leinhart, & Madden, 2014). Finally, with 288 million active users, over 500 million Tweets sent per day, and 77% of accounts being outside of the United States ("About Twitter", 2015), it is clear that use of Twitter to communicate is a growing phenomenon, not only in the United States but throughout the world.

With the increased influence of social media in the real world and increased usage of social media for personal learning and connections, social media has the potential to dynamically change the way learners learn and teachers teach. In education, social media can be used to supplement cognitive and meta-cognitive development (Blaschtke, 2014), to encourage and develop civic engagement ("Civic Engagement Through Digital Citizenship, 2012), challenge the status quo in educational practice and share new ideas among teachers (Cooke, 2012; Goodyear, Casey, & Kirk, 2014), build a learning community within a course (Feliz, Ricoy, & Feliz, 2013), and to promote interest among STEM fields (Judd & Graves, 2012), among other things. While the potential for application in education is far-reaching, at present due to the newness of the field, there are often more questions than answers.

Statement of the Problem

To attempt to answer some of the many questions regarding social media in general and Twitter in particular, this study will seek to understand the influence that the utilization of Twitter has on student engagement and performance. Specifically stated, this research will seek to address these three issues:

1. The purpose of this study is to see if there is a relationship between students' educational use of Twitter and academic performance in a high school Advanced Sociology course as measured by end of the semester whole class average compared to past end of the semester whole class average.

2. This study will determine if there is a relationship between the incorporation of Twitter and increased student engagement in the curriculum as measured by comparing past student online discussion engagement and current student discussion engagement through Twitter as measured by the average number of posts per student.

3. Lastly, this study will assess student perceptions regarding the usage of Twitter as an educational tool through a pre and post study 5 point Likert scale survey.

Research Questions

1. To what degree does incorporating Twitter in a high school Advanced Sociology course influence student performance as measured by whole class average?

2. How does the incorporation of Twitter into a high school Advanced Sociology course influence student engagement in online discussions as measured by average number of posts per student?

3. To what degree does the incorporation of Twitter into a high school Advanced Sociology course influence student perception regarding the usage of Twitter as a viable education tool?

Hypotheses

1. The incorporation of Twitter will have a statistically significant positive influence on whole class end of the semester average.

2. The incorporation of Twitter into a high school Advanced Sociology course will significantly influence student engagement online as measured by average number of student posts using Twitter compared to past online discussion boards.

3. Utilizing Twitter in an Advanced Sociology course will influence student perceptions of the validity of Twitter's usage as an educational tool in a positive manner.

Significance of the Study

While the findings of this study may be of interest to a variety of different populations, including people in communication, social change and various social sciences, this research will be of particular interest to educators in general, and educators of high school students in

particular. This study involved students who were high school juniors and seniors enrolled in an advanced, dual credit course offered cooperatively between a suburban school district's two high schools and a community college in the region. Therefore, this research will be of interest to people working with students in this age group, in 100 level college courses, and in courses in which a focus is on actively engaging in the curriculum and discussing a variety of viewpoints, such as philosophy, debate, and ethics courses. Finally, this study will also be of interest to educational leaders, technology support specialists, and reformers, who are continually seeking ways in which to improve student engagement and performance.

The results will be beneficial because they will allow educational stakeholders to compare the value of using social media to engage students with a course. Since more engaged students perform better in school (Hattie, 2009), adopting the best platform and methodology for increasing student engagement will invariably lead to increased student grades, graduation rates, better school evaluations and, most importantly, deeper student learning. Furthermore, if the tool being measured (Twitter) proves to be an effective tool, schools will be able to utilize that tool instead of other tools, and therefore save money since Twitter is free. Finally, the results will help to clarify how Web 2.0 tools in general and Twitter specifically present unique benefits and challenges in our educational system.

Definition of Terms

In any intellectual engagement, it is important to understand what people mean when they use specific language. This section will clarify terms being used to develop a common method of thinking and assessing relevant concepts being addressed. Preference in used definitions is given to originating cites when possible (e.g. the definition for Twitter and Twitter related terms

are taken specifically from Twitter's official website). Terms and common abbreviations not cited are developed specifically by the researcher for his specific course and study.

Social Media: Widely used term for web-based platforms which allow users to interact, work together, exchange information and communicate (Holotescu & Grosseck, 2012).

Twitter: A web-based social media platform which allows users to share and generate thoughts and information instantly ("About Twitter", 2015).

Tweet: A thought, concept, or memory captured in a real time message on Twitter, often including a link, photo, video and/or text, limited to 140 characters ("About Twitter, 2015).

Chats: A hashtag based and sorted conversation, usually among a group of people based around a common interest, which typically "meets" online on a specific day at a specific time each week. Users can follow and participate in the chats by following a specific chat's hashtag, such as "#edchat" or "#ndedchat" (Herbert, 2012).

Hashtag: Indicated with a number sign (#), hashtags are included in tweets usually at the end as a way to identify your information as being part of a specific topic ("About Twitter, 2015).

Professional Learning Networks (PLN's): "A community of learners around the world who are learning together," primarily by communication and collaboration through web-based tools (Ferguson, 2010, p. 13)

Klout Score: "The Klout Score is a number between 1-100 that represents your influence. The more influential you are, the higher your Klout Score. Influence is the ability to drive action. When you share something on social media or in real life and people respond, that's influence. The more influential you are, the higher your Klout Score" (The Klout score, 2014).

Web 2.0: "…a wide variety of web-based technologies that enable users to contribute, share and consume information" (Balakrishan, 2014, p. 595).

21st Century Skills: Skills applicable to modern life which emphasize application, flexibility, communication, working with others, thinking critically, and problem solving, often through modern, technologically based tools (Saavedra & Opfer, 2012).

Limitations

1. The sample for this study is composed of upper level students in an elective course, and therefore may not be generalizable to students enrolled in general courses.

2. The sample is composed of a large percentage of female students and thus may not be generalizable to all students.

3. Survey participants may not answer the questions completely honestly, and therefore responses might not accurately represent all members of the population.

4. The study was completed at two high schools in a suburban and generally affluent but ethnically diverse Midwestern town. Results may not be generalizable to schools with different demographic compositions, with different cultural backgrounds, and/or different access to technological resources.

Delimitations

1. Since class average comparisons are being used from one year to the next, care was taken to ensure that no grading policy changes were made; the text book, notes, quizzes, projects, and assignments were kept nearly identical, with the exception of changes relevant to the study (e.g. reformatting discussion board posts to fit Twitter's requirements, changing directions on the syllabus and course procedures relative to the discussion boards) and minor

yearly corrections and changes (e.g. fixing typos, changing names of students in example questions, updating statistics to be relevant to the new school year, etc…)

2. The same instructor taught the courses each year in the same classrooms with the same access to materials and resources.

Assumptions

1. The students enrolled in the classes from one school year to the other will not vary significantly in demographic composition, intelligence, work ethic or content knowledge regarding the course content.

Organization of the Study

Chapter 1 presented an introduction, statement of the problem, research questions, hypotheses, significance of the study, definition of terms, limitations, delimitations and assumptions regarding the study. Chapter 2 presents a summary of key research in the literature related to the problem, specifically regarding the changing dynamics of schools, blended learning, teachers modeling the usage of Web 2.0 technologies, the use of Web 2.0 technologies and social media in general, and the use of Twitter in education. Methodology is discussed in Chapter 3, with analysis and findings of the study to be included in Chapter 4. Chapter 5 will contain a summary of the findings, conclusion, a discussion, and suggestions for further study.

CHAPTER 2. LITERATURE REVIEW

There are many variables that influence student performance and engagement, with some variables having a great effect on student performance than others (Marzano, Pickering & Pollock, 2001). Other, more recent research has concurred: certain variables will have a larger influence than others on these outcomes (Hattie, 2009). While there is an extensive history of research regarding the issues of student performance and engagement, research regarding the usage of social media in education and its effects on student performance and engagement is not as developed due to the recent rise of social media (Junco, 2014). One analysis of Twitter and education specifically put it rightly when it stated that "the use of Twitter is still new in the arena of teaching and learning as it was first introduced in 2006" (Alias et al., 2013, p. 779). However, technology in general provides students with a variety of ways to demonstrate learning and growth regarding 21st century skills (Dede et al., 2005). Furthermore, the seamless technological integration in the real world of technology combined with recent generations being "digital natives" (i.e. people who have grown up in the internet age with wide access to technology and information) has led to a demand for systematic technology integration in education that is so strong it is "no longer a matter of choice" for the social institution of education (Castro & Andrade, 2011, p. 3377). Therefore, this review of literature will provide an overview of social media usage and similar Web 2.0 technologies in education specifically. In short, this chapter will be divided into five sections, including summaries of key research findings regarding changing dynamics of schools, blended learning, teachers modeling the use of Web 2.0 technologies for learning, Web 2.0 implementation in courses, and Twitter implementation in courses.

Changing Dynamics of Schools

The incorporation of social media and other Web 2.0 technologies in the classroom creates a number of situations in which the traditional nature and methodology of teaching is challenged, and where the expectations of courses can become more responsive to student's learning preferences (Holotescu & Grosseck, 2012). While social media has shifted dynamically from generally a fun enterprise to the primary way of getting news and sharing information for many individuals (Huwe, 2012), it also changes the nature of the classroom dynamic which makes many educators uncomfortable (Zhang, 2009) and has required school districts to develop new policies and expectations regarding how teachers can and should relate to students using social media (Kennedy, 2011). Educators historically have expected students to "behave predictably, follow rules, and concentrate on academic achievement…" (Zhang, 2009, p. 276), and social media usage can change that element of schooling. Social media allows for the creation of course dynamics where the power dynamic shifts away from the instructor towards the students, which is not something many instructors are comfortable with, and which creates some unique situations which instructors must anticipate and deal with while incorporating these changes (Young, 2010).

Despite many arguments in favor of changes incorporating more technologically based tools in schools, there are voices which are arguing to take a more reasoned and methodological approach. Walmsley (2014) argued that, while technology allows us to access information and people in a manner which was unimaginable just a short time ago, we are losing something as a society when "virtual world becomes the default mode of communication in the real world" (p. 80). Walmsley argued, among other things, that we should encourage and expect students to practice face to face communication, teach digital communication etiquette, and balance our use

of technology with the recognition that speaking face-to-face with individuals is a skill that will still be needed in our modern world (Walmsley, 2014). Others (Fouts, 2012) have pointed out that a deficiency in these skills could lead to difficulties in successfully completing an interview for a job or college admission, and others have observed that many of these tools and changes are not "research-based," and that "The most important thing to remember is that we have no idea what impact these tools have on learning, and it will take a decade to answer that questions" (Manzo, 2009, p. 14).

In addition to concerns about appropriateness and over-reliance on technological tools in communication, Web 2.0 tools also present a number of practical challenges in their implementation. One way that Web 2.0 tools have been utilized is in flipped learning, where students do homework during class time with assistance from the instructor and use technology to facilitate instruction outside of class time (Fulton, 2012). In these instances, support from IT departments, time, and thoughtful educators are identified as the key challenges facing educators who want to incorporate technology in this way (Bergmann & Sams, 2012). Other researchers who generally focused on the positives of using Web 2.0 technologies also conceded that technological problems existed, including "too many logistical issues" (p. 32) and being hard and confusing for first time users (Bull & Adams, 2012), the necessity of instructing students regarding how to use the platform(s) to "obtain a real efficiency of the educational act" (Holotescu & Grosseck, 2012, p. 2154), and a lack of acceptance as compared to institutionally supported content management systems (Blazer, 2012; Murphrey et al., 2012).

Additionally, social media and other modern technologies directly challenge assumptions about what education is and where it should take place (Bartow, 2014; Journell, Ayers & Beeson, 2014). Web 2.0 technologies in general, and in particular social media, such as Twitter and

Facebook, allow students to develop new constructivist learning communities, supplement the development of academically based informal group formation, and provided a neutral forum to share concerns and support each other emotionally (Rambe, 2012). Some of these new constructivist learning communities are not limited to school, town, state or even country. Rather than simply allowing students to collaborate between classes or across a city, educators have used Twitter to collaborate between students across a state (Journell, Ayers & Beeson, 2013), across our country (Cook, 2013), and around the world (Markham & Belkasim, 2011).

Despite these ways that teachers have used Twitter for their own professional learning and training, the trend is for teachers to not allow their students an opportunity to do the same in the formal school setting, often because in many instances social media platforms still remained blocked at schools across the country (Carpenter & Krutka, 2014). As it relates to new technologies, strict organization of school structures has a tendency to limit the "chaotic" elements of the creative and innovative learning that Web 2.0 technologies strive for (Zhang, 2009), despite the fact that students can pursue deep learning experiences relevant to what they are interested and talented in through various Web 2.0 technologies (Ruokonen, Kiilu, Muldma, Vikat, & Ruismaki, 2011). Finally, the Children's Internet Protection Act (CIPA) and the Protecting Children in the 21st Century Act provide a powerful incentive for schools to very cautious in implementing Web 2.0 technologies, which at times results in completely blocking these tools in schools (Blazer, 2012).

There are other voices which acknowledge the weaknesses of these changing dynamics. On the extreme end of using digital technologies, some argue that Web 2.0 tools can not only add to traditional school in a blended approach, but can replace schools as places of learning (Davis, Eickelmann, & Zaka, 2013). Doing so can have a number of unintended

consequences, such as not accomplishing much of what education is about, namely developing character elements and moving beyond students own self-interest (Schneider, 2013). Additionally and specifically, incorporating social media in the classroom can result in a loss of focus and create informality in learning that may become counter-productive (Lin, Hoffman, & Borengasser, 2013). To counter the perspective that social media leads to distraction, many will argue that students have always been distracted by something in the classroom, but that argument ignores that "students' fixation on social media proves to be a more powerful distraction than most" (other distracting variables) (Abe & Jordan, 2013, p. 17).

Additionally, the connectivity that social media provides can be shallow compared to authentic and real-world relationships. This can lead to students' reliance on social media as a means for consuming information rather than actually generating and being involved directly in a participatory fashion with the material and class (Lin, Hoffman, & Borengasser, 2013). In one study, while a number of students used Twitter for academic reasons (27.7%) and for sharing information (48.2%), the largest percentage (65.7%) of students reported using Twitter for "seeking information" (Knight & Kaye, 2014). This point (that Twitter can lead to people focusing on seeking information and not completely engaging in a true collaborative network) was further solidified by Risser (2013), whose case study of a novice teacher showed an emphasis on requests for information, and declining usage over the course of the teacher's school year.

Social media specifically can also lead to a perception that connectedness and other 21st century changes are occurring in the classroom when in reality they are not. For example, Hirst and Treadwill (2011) elaborated on this point by asking students a variety of questions regarding the nature of online relationships. When asked if online Facebook friends were synonymous

with real world friends, only 21% agreed, whereas 47.6% said sometimes and the remaining 31.4% said that they were not friends. Other researchers have pointed out that just simply plugging in, connecting to the Internet and adding Web 2.0 tools will not in and of themselves change the teacher's fundamental role from instructor to facilitator. Rather, in addition to the incorporation of new tools, new frameworks need to be established which allow teachers to "act collectively in flat organizations with strong professional communities where they can shift roles seamlessly" (Martinez & McGrath, 2014, p. 42).

Incorporating Web 2.0 technologies in general and social media such as Facebook and Twitter in particular can lead to a variety of concerns regarding student behavior. While many of these concerns are also present in a traditional classroom (Journell, Ayers & Beeson, 2014), there are unique challenges presented when incorporating these tools. Often, these platforms are used by students as a means to bully and threaten other students (Hinduja & Patchin, 2011). This is particularly concerning because research has shown that cyber bullying is more harmful in some ways that traditional (verbal, relational and physical) forms of bullying. In a study of 399 secondary students (8^{th} – 10^{th} grade) in British Columbia, researchers found cyber bullying and victimization to be separate issues than traditional bullying in the sense that individuals who participated in or were victims of cyber bullying did not necessarily participate in traditional forms of bullying. Furthermore, cyber bullying contributed to 5.8 % of the variance for suicidal ideation for victims and 4% for the perpetrators (Bonanno & Hymel, 2013).

Social media also presents a unique challenge of focus which can lead to new student distractions. In one study, 15.38% of students reported that social media was detrimental to learning because "It is distracting and time consuming" (Ozan, 2013, p. 51). Furthermore, communication via social media can exacerbate student attention issues and lead to difficulties

identifying what good information is due to the volume of tweets and posts being submitted (Fincham, 2011).

Before Twitter or other social media tools can be effectively implemented into a classroom, a cultural shift regarding perspectives on using social media in the classroom is needed (Messner, 2009). This shift will come as experienced teachers see the benefits of this technology (Miller, 2010), and as "digital natives" become the norm leading the classroom, and principals realize, as Brad Lewis, the executive director of the International Society of Technology Educators, stated "It's about helping people feel comfortable with the biggest part of that change, which is the evolving nature of what it means to teach" (Cook, 2013, p 21). Redman and Trapani (2012), in a sample of 108 pre-service teachers, found that technology use was pervasive among this group, and that most (72%) had positive view of the potential of future technological applications in their classrooms, but most had demonstrated a limited vision for using technology to develop and demonstrate higher order instructional practices, and acknowledged the need for additional training.

Blended Learning

Blended learning, learning in which traditional class is combined with outside elements delivered mostly through technology, has been utilized by many educators for a while, and interest in blended learning is expanding (Sancho & Vries, 2013). In short, blended learning seeks to take elements of distance learning and in class learning and maximize their best respective attributes (Kazu & Demirkol, 2014). Early in the 21st century, one of the many ways blended learning opportunities have been delivered is through the implementation of Wikis, where students can create and share content, discuss topics on a discussion board, engage in the course community outside of class time and obtain course information (Chang, Morales-Arroyo,

Than, Tun, & Wang, 2010/2011; Higdon & Topaz, 2009; Mindel & Verma, 2006). Another popular tool, E-portfolios, have also been used to deliver a blended learning model where students continually add, interact and share what they are learning and what they have accomplished throughout their academic career (Mandviwalla, Schuff, Chacko, & Miller 2013).

Blended learning at times has shown promise and at times has obtained mixed results. Kazu and Demirkol (2014) conducted an experimental study involving blended learning and its effect on content achievement learning and final test achievement. Researchers gave a pretest and posttest to assess each group's prior knowledge, finding no significant difference between the two groups. At the end of the study, both males (75.78 to 71.11 mean) and females (85.62 to 74.44) in the experimental group showed statistically significant greater performance than their counterparts, especially within the female sample. However, a year-long experiment conducted by Smith (2014) found no statistically significant difference in performance between the same course delivered in a traditional manner and a course delivered in a blended manner. Interestingly, this same study found a statistically significant difference regarding student perception of engagement and teacher support, with the blended class measuring more positively in this instances (Smith, 2014).

Many other researchers have shown how a blended approach can improve class a sense of community and outside of class interaction with other students and content. McFall and Morgan (2013) found that blending learning using Twitter and Paper.li (a Web 2.0 technology which compiles online newspapers based on Tweets) encouraged community building and sharing ideas among a diverse group of students. Blended learning models, including flipped learning, can motivate students to engage more intensely with the course content outside of school hours (Carpenter & Pease, 2012). Blending learning through usage of Web 2.0 technologies can also

be used to expand student interaction and content application through the application of interdisciplinary activities (Greenhow, Robelia, & Hughes, 2009).

While Facebook, Twitter and other social media tools have provided new ways to deliver blended learning opportunities, each tool has clear benefits and drawbacks (Tagtmeier, 2010). Whether the use of social media is for specifically delivering content in a blended fashion, or whether it is simply to communicate with key stakeholders in an educational institution, a consistent commitment in implementing social media must be maintained if it is to be as successful as possible (Palmer, 2013). Furthermore, if blended methods and communication using social media are to be effectively implemented, teachers must communicate with parents to understand "what the project is all about and the safety procedures that have been put in place" (Kist, 2013, p. 11), and the different access rates of technological tools among low income and minority families must be accounted for (Swindle, Ward, Whiteside-Mansell, Bokony, & Pettit, 2014).

Teachers Modeling the use of Web 2.0 Technologies for Learning

Educators have been early adopters of Social Media (particularly Twitter) in search of improving their educational practices and professional learning network. This mostly takes the form of "chats." Examples of popular chats include #edchat, #sschat and #sblchat. These chats allow educators to engage with other professionals who are interested in similar areas of study to further their professional practice and learning (McLean, 2014). Furthermore, these chats allow teachers to seek out areas of professional development that are in-time, focused and relevant to their unique practices, subjects and concerns (Herbert, 2012). Finally, educators have used these chats to expand their ability to build connections with other teachers in professional learning networks (PLN's), which have expanded in size and scope to a level that previously would have

been difficult at best and impossible at worst (Krutka, 2013). By utilizing the hashtag (#) feature of Twitter, regardless of whether it is affiliated with an existing "chat," educators can tag information they post or search for specific tags to build their PLN (Miller, 2010).

Structured professional development also has been designed to prepare current and future teachers regarding how Web 2.0 tools can be utilized to increase student performance and engagement. With regard to these technologies, researchers (Archambault et al., 2010) have identified the need to seamlessly tie technology tools with content and pedagogy to avoid the emphasis on just learning about the technology and not specifically how to use it. Archambault's study concluded that some of the benefits of specifically training teachers to utilize social media in their instructional practices include teacher facilitation of allowing students to more effectively rely on each other instead of just the instructor, increased student ownership of learning, and more efficient and consistent instructor feedback. Furthermore, Archambault (2010) reported that of the 20 instructors who participated in this training, 16 (80%) believed that the redone curricular units, which incorporated social media, increased student achievement.

Modern technologies have also been incorporated into the training of professional teachers at the collegiate level. For example, Twitter has been used to build a community of practice in pre-service teachers. In one course, pre-service teachers posted in a course discussion 161% more on Twitter than required on a typical discussion board during a 14 week period (Kim & Cavas, 2013). Additionally, teachers in a graduate course who already were employed observed that Twitter helped them discovered new information and studies that were "directly relevant to their professional work" (Nicholson & Galguera, 2013, p. 16).

Social studies teachers specifically have expanded their professional learning network and professional development through the #sschat hashtag for Social Studies in general, and the

#Wrldchat and #APUSHchat hastags for World History chat and Advanced Placement United States History specifically (Krutka & Milton, 2013). These edchats (and others) allow teachers to search on the Twitter microblogging platform for topics specifically tied to Social Studies, their specific discipline and education. Furthermore, #sschat (and other edchats) allow educators to develop active, real-time discussions on a weekly basis (e.g. #sschat "meets" online Mondays at 7PM CST) where they can collaborate on activities and seek out ideas from educators beyond their community (Krutka, 2013). Bartow (2014) also identified that social media allows teachers to "engage in more transient and elastic networks" (p. 52) which greatly facilitate teacher's abilities to keep up with new educational trends and resources. Sociology instructors specifically have also participated in these platforms (e.g. The Teaching Sociology Google Group) and other OTCNs (Online Teaching Community Networks) to expand their teaching tool box and for informal mentoring (Palmer & Schueths, 2013).

While educators have been early adopters of guiding their own learning through social media in this manner (specifically through Twitter with chats, as discussed previously by Daniel Krutka, 2013), students (particularly students outside of the university system) generally have not picked up on this method. However, students do use social media for their learning in a variety of ways. Students will often use social media as a way to organize study groups, contact specific people for help with learning, and to seek out information regarding what is going on in their specific educational institution (Reed, 2013).

Web 2.0 Implementation in Courses

Empirical studies regarding the influence of Web 2.0 and social media are hard to find, in part because of the difficulty in identifying a universal definition for what Web 2.0 and social media mean, and in part because of sampling issues (Tess, 2013). Veletslanos (2012) also

identified the level of research regarding scholars' usage of social media as shallow. Additionally, an analysis of seven major educational technology journals found only four studies specifically related to Twitter usage from 2007 to 2012, showing the limited nature of research regarding one of the major social media platforms (Alias et al., 2013).

Despite the limited amount of research, social media has also been utilized as a means to share key information with students (such as student announcements) in institutions. In one study, 70% of respondents indicated that they would prefer Facebook, while 16% preferred Twitter and 13% preferred Google+ for social media based communication. However, in that same study, 75% of respondents would prefer information regarding scheduling and registration be shared via website, as compared to only 11% on social media (Balubaid, 2013).

Social studies teachers have also used Web 2.0 technologies in a variety of other ways. Modern technologies should be used as a means to provide students with access to relevant, authentic, real-world examples related to the curriculum of their specific course in a manner that focuses on problem solving and critical thinking in a way which was not previously possible (Tanner, 2009). Teachers have also identified the importance of media literacy in areas related to the social studies, with 92% of one group identifying that they agreed or strongly agreed that media literacy should prepare students for "new tools for learning and self-expression" (Stein & Prewett, 2009, p. 140).

Using social media and Web 2.0 technologies in education present a number of practical challenges for instructors in their application of these technologies in their respective classrooms. First, the great strength of using Web 2.0 technologies is that students can collaborate and communicate with people across the world, building unique and authentic information while critically thinking in a community of learners in a flexible way (Saavedra &

Opfer, 2012). However, this expanded network also builds into a great weakness: that much of the content is unreliable and of low quality, and that it promotes "amateurishness" with material established and posted by a variety of learners who often have minimal background in the content (Grosseck, 2009). Instructors at some institutions also have perceptions that incorporating social media into the classroom will decrease the quality of communication in their courses (Settle et al., 2012).

Another unique challenge of utilizing social media and Web 2.0 technologies in the classroom are concerns regarding separating the wheat from the chaff. In one study of 34 students over six weeks regarding the usage of microblogging in a college course, there were 11,214 posts, which gradually increased in volume from on average 3.5 to 4.5 per day (7.5 posts per day if holidays and off days were factored into the calculations). When compared with other microblogging platforms, this number of daily posts is significant and presents a challenge in tracking and managing for instructors (Ebner et al., 2010), especially for instructors who were managing large classes (Kassens, 2014). New users also mentioned a tendency to want to stick to existing tools which they were familiar with instead of switching to Web 2.0 technologies (Nicholson & Galguera, 2013).

Students have used social media to communicate, collaborate and engage with student outside of their school, with sometimes successful, sometimes limited and sometimes inconclusive results because of the unique limitations of the respective platforms. Markham and Belkasim (2011) used Twitter as a means to encourage student engagement between a class in Australia and a class in the USA, but found the 140 character limit too restrictive to be as effective as it could be. Hew and Cheung (2013) conducted a comprehensive review of empirical studies (excluding survey and anecdotal data) regarding the use of Web 2.0

technologies in K-12 and higher education. In their conclusion of the research, they identified that the evidence related to the effect of Web 2.0 technologies on learning outcomes is weak, and that the positive outcomes observed could be due to other extraneous variables and not the influence of the technology in and of itself, other than potentially due to a "novelty" factor (Hew & Cheung, 2013).

Twitter Implementation in Courses

Studies have had positive results regarding the usage of Twitter for sharing class announcements and other purposes. Bicen (2014) found that when compared to pre implementation testing, student opinion regarding Twitter usage improved in every area of the 24 areas measured, including ease of following course announcements, obtaining different points of view, providing quick notifications, and making the course more interesting. Other researchers (Blazer, 2012; Larkin, 2013; and Moran, Seaman, & Tinti-Kane, 2011) have found communicating via social media to be a practical way to disseminate information to stakeholders, regardless of the stakeholder's specific relationship with the person initiating the communication.

Twitter can also be used as a way for individuals to influence and shape policy decisions and discussions in society as a whole. This movement has been demonstrated in education specifically by a few key groups and individuals. Measured in terms of Klout scores (0 is no influence, 100 is the most possible influence), reformers and thinkers such as Vicki Davis (Klout score of 75), Diane Ravitch (Klout score of 73) and Eric Sheninger (Klout score of 69) have more online influence than the U.S. Education Department (Klout score of 65). As compared to the past, where influence was measured in editorials in newspapers, Twitter now provides a viable means of influencing reform for educators (Petrilli, 2011). Furthermore, teachers using Twitter as a means to influence their world reaches beyond knowledge consumption and even

knowledge construction to wisdom generation by providing a framework in which many different stakeholders can dialogue regarding cases based in "practice and policy" in a system where there are "community norms that respect not only theoretical rigor and empirical evidence but also interpersonal, experiential, and moral-ethical understandings" (Dede, 2009, p. 260).

Similar to how Twitter can be used to influence the world as a whole, Twitter has also been utilized as a means to encourage and increase social presence in courses (Dunlap & Lowenthal, 2009). Social presence allows students to insert elements of themselves into a course and be identified as unique persons (Garrison, Anderson, & Archer, 2000). Twitter, and other instances of Web 2.0 technologies, have a number of advantages which make this process easier. For example, even when not required, students will often choose to engage in course discussion and content using social media. Seventy-five percent of students in one course incorporated Twitter via the Hotseat platform even when it was not required, formally assessed or graded (Young, 2010).

As compared with a typical Learning Management System (LMS), Twitter allows for a much more seamless interaction among students because it does not require setting aside time to log in and check for many users, since they often have Twitter on a smart phone (Dunlap & Lowenthal, 2009). Secondly, Twitter allows people to tag items of interest with a hashtag (#), and search for items based on these hashtags. There are even additional Twitter organizers (such as TweetDeck and HootSuite) which make this process even easier (Ferguson, 2010). Furthermore, from a technological standpoint, researchers have also pointed out that Twitter has some benefits over other technologically based tools, such as faster response times when compared to cellular systems (Judd & Graves, 2012).

Twitter can also be used as a means to encourage engagement with the required course reading. In many courses, especially in introductory college courses, advanced secondary courses, and dual credit courses, the amount of required reading is extensive. Despite this fact, many students do not fully engage with their reading (Park, 2013). Twitter and other Web 2.0 technologies could be used as a means to encourage student engagement with the text by requiring students to post and reply regarding the text, and (specifically in the instance of Twitter) the technology can be easier to navigate due to the ability to visit the same site and follow course discussions (Park, 2013).

Additionally regarding reading, Twitter has been used to summarize points of view, character development, and key ideas in chapters of reading (Barone & Mallette, 2013). While the limitation of information to 140 characters has been frustrating to some (Markham & Belkasim, 2011), Barone and Mallette (2013) found it to be a good thinking skill, especially for boys. Meta-analysis of technologically based reading improvement strategies have found generally positive (+0.16) but minimal improvements in reading outcomes as compared to typical methods (Cheung & Slavin, 2012).

Twitter can also be used as a means to enable students to discuss interpretation of debated texts. Williamson (2013) had students listen to the Gospel of Mark, and then tweet their interpretation of texts in real time. Afterwards, students completed an analysis assignment where they dissected the class's Tweets regarding the text, looking for patterns, connections to the real world and how different texts evoked divergent responses. This allowed students to see that different individuals interpret text differently, and allowed challenging class assumptions from guest "Tweaders" (tweeters and readers). Regarding how helpful using Twitter was in

understanding what a text was saying, 75% of the students rated the exercise as a 4 or 5 on a 5 point Likert scale in their understanding and analysis of the text (Williamson, 2013).

Besides using Twitter to influence policy decisions, obtain knowledge, and develop wisdom, these tools can also be used to develop skills in students while they are completing authentic service activities. Crews and Stitt-Gohdes (2012) used Facebook and Twitter to sharpen students' communication skills while working with non-profits. As part of a business course, students were tasked with using these social networking platforms to communicate for non-profits in a variety of ways, which both helped the community at-large through these non-profits, and allowed the students to develop real-world communication skills.

Also, Twitter can be used as a means to build relationships and an environment of working together among students in a course, and between students and instructors. As one student observed regarding a course they took which utilized Twitter "I feel very close to this group and Twitter had a good part in that" (Domizi, 2013, p. 49). Twitter usage by instructors is also correlated with improved student perceptions of teacher credibility, immediacy and content relevance (McArthur & Bostedo-Conway, 2012). Additionally, when students were required to tweet regarding a course topic prior to lecture, and then that information was incorporated into class through formative assessment, clarifying essential concepts, and addressing student questions, between 86% (in the second year) and 93% (in the first year) suggested continuation of using Twitter, and the usage of Twitter suggested more effective student preparation for course during time spent outside of the classroom (Retelny, Birnholtz, & Hancock, 2012).

While the amount of research regarding Twitter is limited and difficult to generalize because of reliance on convenience sampling and self-reporting (Tess, 2013), some research has been especially promising regarding the outcomes of Twitter. Rey Junco, a college professor

who specializes in using social media in education (Junco, Elavsky, & Heiberger, 2013; Junco, Helbergert & Loken, 2011) conducted an experimental study of first year pre-health professional majors. Students were in a required introduction course for all students in that college. All students were required to complete additional discussions and interactions using either Twitter or the school learning management system, Ning. Students were randomly assigned to either use Twitter or Ning, and measured in a two-fold manner: an ANOVA scale of student engagement and end of the semester GPA. Both measures of engagement and grades significantly indicated improvement in the experimental group over the control group, with students in the experimental group having an engagement score of 5.12 and the control group having an engagement score of 2.29 as measured on a seven point Likert scale. In regards to GPA as measured on a 4.0 scale, students in the experimental group having a GPA of 2.79 and students in the control group having a GPA of 2.28 at the end of the semester (Junco, Elavasky, & Heiberger, 2013; Junco, Helbergert & Loken, 2011). This overall GPA calculation presents a counter-claim regarding other within class research, which suggests that students increased their posting because they were "playing the game" of posting due to the required nature of the use of microblogging as it was tied to course grades (Ebner et al., 2010). Regardless, students in other studies have pointed out the appeal of using Twitter among students due to enabling them to contribute to class discussion with less fear of embarrassment (Tiernan, 2014).

Social studies teachers specifically have also used Twitter in a number of ways in their classrooms. One study (Bull & Adams, 2012) completed at the request of the American Historical Association sought to incorporate Twitter as a way to encourage students to engage nationally in a discussion regarding the Founding Fathers and the Bill of Rights. In this study, the teacher created a Twitter page in which the students would interact by posting reflections,

linking primary sources, discussion, and pointing out key events. On a five point scale, students' perception of the use of Twitter was 2.98. Interestingly in this study, female students had a mean score of 3.36 and males had a mean score of 2.77, suggesting there are tangible differences between how students of a different gender respond to social media usage (Bull & Adams, 2012).

For example, educators have used Twitter to enable students in government courses to follow the 2012 presidential debates and election while debating and discussing outcomes with not only the students inside their school but also outside students (Journell, Ayers, & Beeson, 2013). Economics courses have also tweeted reflections of the 2013 State of the Union Address, in addition to other reflective assignments related to economics specifically (Kassens, 2014), expanding the class discussion to include other classes and people. In the instance of the 2013 State of the Union, there were over 1.3 million tweets, "creating an unintended class over a million strong" (Kassens, 2014, p. 104). This study also observed that Twitter led to an increase in student performance, especially as related to content, and 76% of the students identified that Twitter helped to clarify course material (Kassens, 2014).

CHAPTER 3. METHODOLOGY

Restatement of the Problem

To revisit the study before us, here is a restatement of the three-fold purpose of this study, as well as the research questions and hypotheses:

1. The purpose of this study was to see if there was a relationship between students' educational use of Twitter and academic performance in a high school Advanced Sociology course as measured by end of the semester whole class average compared to past end of the semester whole class average.

2. This study will determined if there was a relationship between the incorporation of Twitter and increased student engagement in the curriculum as measured by comparing past student online discussion engagement and current student discussion engagement through Twitter as measured by the average number of posts per student.

3. Lastly, this study assessed student perceptions regarding the usage of Twitter as an educational tool through a pretest and posttest student survey.

Research Questions

1. To what degree does incorporating Twitter in a high school Advanced Sociology course influence student performance as measured by whole class average?

2. How does the incorporation of Twitter into a high school Advanced Sociology course influence student engagement in online discussions as measured by average number of posts per student?

3. To what degree does the incorporation of Twitter into a high school Advanced Sociology course influence student perception regarding the usage of Twitter as a viable education tool.

Hypotheses

1. The incorporation of Twitter will have a statistically significant positive influence on whole class end of the semester average.

2. The incorporation of Twitter into a high school Advanced Sociology course will significantly influence student engagement online as measured by average number of student posts using Twitter compared to past online discussion boards.

3. Utilizing Twitter in an Advanced Sociology course will influence student perceptions of the validity of Twitter's usage as an educational tool in a positive manner.

Review of Related/Select Literature and/or Research

In the process of completing the review of literature and research regarding the implementation of Twitter in education, various databases and sources were utilized. Data sources included Journal Storage (JSTOR); Education Resources Information Center (ERIC); Education Source (EBSCO) accessed through North Dakota State University library databases (Fargo, ND), which pulls from *Academic Search Premier, Web of Science, Science Direct*, JSTOR and *Cambridge Companions Online*; EBSCO MegaFILE accessed through West Fargo Public Schools library (West Fargo, ND), which pulls from *Academic Search Premier, Business Source Premier, MasterFILE Premier and Regional Business News*; and Google Scholar.

Population and Sample

The population of this study included all students enrolled in Advanced Sociology courses in two suburban Midwestern secondary schools within the same school district that were taught by the same instructor. The official school enrollment reported to the state of one school was 1013 and the other was 1423 in the fall of 2015. The course is an elective course that juniors and seniors can take. Most of the students who chose to enroll in the course go on to

enroll in four year colleges and universities. Additionally, the composition of the course includes students who mostly are from the upper levels of their class in terms of course rank determined by GPA.

This study involved a quasi-experimental approach in which the performance and participation of one population of students from the fall semester of 2014 was compared to the population of the students from the fall semester of 2015. The population of the course in the fall of 2014 included 57 students total, with the class being composed of 30 (53%) junior students and 27 (47%) senior students. A majority of the students in the fall of 2014 were females, with 48 (84%) female students and 9 (16%) male students. The population of the course initially in the fall of 2015 included 42 total students with 36% juniors and 64% seniors, and with an identical breakdown of the split for males and females (36% males and 64% females). One student moved in October, therefore dropping the total sample for the fall of 2015 to 41 students. None of the students enrolled in the course in the fall of 2014 were enrolled in the course again in the fall of 2015.

Instrumentation

Since there are three research questions in this study, instrumentation varied based on the specific question that the instrumentation seeks to assess. In regards to the research question related to student performance (question number one), student final grades in the course were compared to student final grades in the course taught in the previous year. To ensure validity and reliability, grades were calculated using the school district's policies, assignments and assessments were delivered and calculated in the same way in each group by the same instructor with the same tools excluding the method of course discussions, and length of the semester in each year was approximately the same. Specifically, regarding the length of the classes, the fall

of 2014 began on August 25th and ended January 16th, with a total of 88 student contact days. Similarly, the course in the fall of 2015 began on August 25th and ended on January 15th, for a total of 87 student contact days.

In the instance of the research question regarding the level of student engagement (question number two), the frequency of student postings on the class website from the fall of 2014 was compared to the frequency of student Tweeting in the fall of 2015. Total number of postings divided by number of students was calculated for the fall of 2014 to find the mean level of student online engagement. This data was then correspondingly calculated for the students in the fall of 2015 regarding the number of Tweets sent per student to see if there was a significant difference between the number of Tweets sent and the number of online discussion board postings from the fall of 2014. As in the first question, requirements for student postings and assignments were kept the same from the fall of 2014 to the fall of 2015 to ensure validity and reliability.

Finally, in regards to research question three and student perceptions regarding the use of Twitter in education, students were given a pretest and posttest survey consisting of the similar questions to assess students' perception on the effectiveness of using Twitter in education. The survey included 28 questions divided into 3 sections. The first section of questions (consisting of 10 questions) gathered data regarding student demographics, access to technological tools, and usage of discussion boards and Twitter. In the second section, students were given 13 questions with each question containing a 5 point Likert scale designed to assess the students' perception of Twitter and other technological tools. Finally, the third section of questions were open-ended questions. These 5 questions sought to identify what students thought were the strengths and

weaknesses of using Twitter specifically, as well as using technological tools in general, in education.

Data Collection

Data were collected for the research questions regarding student performance and frequency of online engagement by accessing existing data for the control group data set (from the fall of 2014) during the fall of 2015, and corresponding data from the experimental group (i.e. students enrolled in the fall of 2015) was collected after the completion of the course beginning in January of 2016. As part of the normal educational processes involved in grading and assessment, this data is already collected or would be collected without completing the study, and therefore simply needed to be accessed for a different purpose.

The pretest survey was completed in class during the first week of class in the fall of 2015, with every student present completing the survey on the second day of class (on Thursday, August 27th) and any absent students completing the survey on a following day of class that week. Students completed the pretest survey prior to using Twitter in the course. Students then completed the posttest survey after receiving the final grades for the course at the end of the fall 2015 semester during the week of January 11th through the 15th of 2016. Any absent students completed the survey in the following week. The students in both instances completed surveys anonymously.

Data Analysis

Data analysis was completed starting in January of 2016. The type of data analysis completed varied based on the specific research question. Data analysis in regard to each research question is as follows:

1. Hypothesis one, that the incorporation of Twitter does have a statistically significant influence on whole class end of the semester average, was tested using a difference of means *t*-test using a 5% level of significance.

2. Total number of student posts divided by number of students in each group was calculated using a difference of means *t*-test, then a test of significance was calculated ($p \leq .05$) to determine if student online engagement was due to the implementation of Twitter instead of a discussion board on the course website.

3. Hypothesis three, that utilizing Twitter does positively influence students' perceptions of the validity of using Twitter as an educational tool, was analyzed by using a paired *t*-test comparing the subscale pretest and posttest means, and by calculating Cronbach's alpha for each subscale to check for adequate reliability. Specifically, subscales for the analysis were created using categories of questions which address similar topics: student perceptions on the effectiveness of Twitter (six questions), student perceptions on the effectiveness of using technologically based tools in class in general (three questions), and student perceptions regarding their skills with using technologically based tools (four questions). Questions of strongly disagree were coded as 1, disagree as 2, neutral as 3, agree as 4, and strongly agree as 5. Mean respondent results per question were calculated for each subscale. These scores were then used to calculate an overall subscale mean for each subscale, which was then used to perform the paired samples *t*-tests.

After these subscales were created, Cronbach's Alpha was calculated for the pretest and posttest for each of these subscales to ensure internal consistency and reliability in these subscales. The effectiveness of Twitter subscale (six items) in each the pretest ($\alpha = .71$) and the posttest ($\alpha = .88$) was found to be highly reliable. The subscale addressing student beliefs about

the effectiveness of technology in education in general consisted of three items in both the pretest and the posttest. While reliability scores were not as high in this instance, they were still acceptable in the case of the pretest ($\alpha = .69$) and strong in the posttest ($\alpha = .79$). Finally, reliability was also strong in the subscale addressing student perceptions related to their technological skills (consisting of four items), with Cronbach's alpha for the pretest and the posttest being .75 and .84, respectively.

CHAPTER 4. RESULTS

The information contained in this chapter will provide a summary of the data gathered throughout the study. Specifically, the data set contained in this chapter will include quantitative data related to student grades in the course, student GPA, number of student posts related to the course and student enrollment demographics. Additionally, qualitative data obtained through the pre and post surveys regarding Twitter usage, student perceptions via survey by Likert scale, and student thoughts in open ended questions were analyzed to identify trends regarding if student impressions related to Twitter changed over the course of the semester and if they believe it is a viable tool for education. The responses from the survey are summarized collectively, with key open-ended responses highlighted to demonstrate trends and key insights. Descriptive statistics and tables discussed in the following section show the potential impact the use of Twitter had on the learning and perceptions of students. Data from those instruments are summarized in the following tables, and some statements from a few students are quoted to illustrate trends that were observed in student perception regarding the usage of Twitter.

Study Purpose

As previously stated, the purpose of this study was to determine if Twitter is an effective educational tool. This study assessed this question through four main approaches. First, the researcher compared the whole class mean grades from the 2014 school year to the whole class mean grades from the 2015 school year with the only instructor variable change being the implementation of Twitter instead of an online discussion board. Secondly, the researcher compared past student usage of discussion boards to the usage of Twitter to see if students were more likely to post on the discussion boards or on Twitter. Next, the researcher conducted a pretest and posttest for the students involved in the study to see if their perceptions regarding the

usage of Twitter changed after using it in class. Finally, the researcher collected archived data from the Fall 2014 student group, including class averages, student GPA, and number of posts made to the past discussion board, in order to compare the experimental group to a control group.

Descriptive Statistics

In order for the effect of Twitter to be assessed, the two groups of students being compared would have to be relatively similar, the instruction would have to be comparable with everything except the method of discussions changing, and the school dynamics would have to be similar. The courses (Advanced Sociology) were taught by the same instructor using the same textbook, same grading criteria, same tests and assignments in the same schools and same classrooms, once in the fall of 2014 and once in the fall of 2015. Table 1 summarizes demographic data regarding the study sample (e.g. student enrollment in the course).

Table 1

Study sample

	Total	Males	Females	Juniors	Seniors
Fall 2014	57	10	47	30	27
Fall 2015	41	13	28	22	19

Since the course is an elective course, enrollment for the course varies from year to year. The sample includes students from two separate schools in the same school district. A limiting factor in the sample is that it is a sample of convenience drawn from juniors and seniors who are enrolled in an upper level course. Students in the Fall 2015 group were given the option of participating in the study using Twitter for discussions or answering questions and being involved in discussions through the online discussion board. All of the students except for one chose to participate in the study, and any study related data (e.g. GPA, surveys) was not collected from this specific student. Furthermore, the first sample included three separate class periods

with a total of 57 total individuals, while the second sample included two class periods with 42 total members initially, with one person moving out of the school district, thereby decreasing the group to 41 students. Finally, the people in each group were different individuals. These differences in composition could have had an influence on course outcomes, but were unable to be adjusted or controlled in this study.

Additionally, as shown in Table 1, both samples were similar in terms of the composition of junior level students versus senior level students and in regards to gender. Sample 1 (Fall 2014; n = 57) was composed of 30 junior level students and 27 senior level students, while sample 2 (Fall 2015; n = 41) consisted of 22 junior level students and 19 senior level students. The similar sample composition regarding grade level students suggests that grade level factors that could influence engagement and performance would be minimal. Lastly, regarding the gender composition of the courses, both courses had a larger number of females over males, with the fall of 2014 having 10 males versus 47 females, and the fall of 2015 having 13 males versus 28 females.

A factor which needed to be considered by using descriptive statistics was whether the student composition was different in terms of academic ability. To determine this, regular, non-weighted GPA was collected for each student enrolled in the course, both in the fall of 2014 and the fall of 2015, and then mean GPA was calculated. This data is summarized in Table 2.

Table 2

GPA and final grades

	Fall 2014	Fall 2015
Mean GPA	3.36	3.41
Mean Final Percentage	85.3	84.5

As depicted in Table 2, the mean non-weighted GPA for the fall 2014 sample was 3.36, while the mean GPA for the fall 2015 sample was 3.41. GPA for each sample was pulled during the summer of 2015, which means that the fall 2014 sample would include more course grades overall for GPA calculations than the fall 2015 sample but could not be adjusted with given data in the grading system. While this number was higher, at the 5% level there is not enough evidence to suggest that GPA in Fall 2015 is significantly greater than GPA from Fall 2014 (t = .49, p = .25). Due to this, it can be argued that the samples (students from the fall 2014 course versus students from the fall 2015 course) did not differ in a statistically significant way regarding academic ability and academic commitment, assuming that GPA is a valid and reliable measure of these variables.

Comparison of Final Course Grades – Discussion Boards vs. Twitter

The first research question in this study's proposal is: To what degree does incorporating Twitter in a high school Advanced Sociology course influence student performance as measured by whole class average? Tables 1 and 2 discussed the composition of the sample in order to see if the samples were similar. Table 2 also includes the mean performance of students in the course.

T-tests were calculated comparing the samples from the fall of 2014 and the fall of 2015 to determine the degree of influence Twitter had on grades and if the students differed. Since, as stated previously, the student samples did not differ as measured by GPA, changes to student performance could be compared. While mean grades did decrease (by 0.8%) from the fall of 2014 to the fall of 2015, there is not enough evidence at the 5% level to suggest the final grades between the two samples are statistically different (t = -0.44, p = 0.5). Therefore, despite the fact

that grades went down, grades did not decrease enough to statistically suggest that the change in variable of incorporating Twitter instead of the discussion board caused the decrease in grades.

As can be seen in Table 2, the mean student final grade percentage in fall of 2014 (with the students who used discussion boards) was 85.3, while mean student percentage in the fall of 2015 (with the students who used Twitter for online discussion) was 84.5. Hypothesis 1 in the study was that the incorporation of Twitter in the course would lead to a significant increase in student grades. Since grades went down, hypothesis 1 is rejected.

Comparison of Student Involvement – Discussion Boards vs. Twitter

The second research question in this study is "How does the incorporation of Twitter into a high school Advanced Sociology course influence student engagement in online discussions as measured by average number of posts per student?" To assess this, data were pulled regarding the total number of discussion board posts sent by the students from the fall of 2014 sample and the total number of tweets sent by students in the fall 2015 sample. In the fall 2014 sample (n = 57 students), the total number of messages posted by the students was 1339, resulting in a mean number of posts of 23.49 per student enrolled in the course. In the fall 2015 sample (n = 41 students) the total number of tweets sent by the students with the class hashtag was 1734, resulting in a mean number of posts of 42.29 per student in the course. The mean number of posts per student in the sample using Twitter was 18.80 greater than the mean number of posts per student in the sample using an online discussion board which was an 80% increase in the number of message posts by students.

An unexpected obstacle in collecting the study data in this area was discovered while analyzing the data. The tool used for the discussion boards in the course during the fall of 2014 is a tool which limits total number of users to 100 total users. This tool is utilized by the

instructor for all of his classes each year. Due to this, and to protect the privacy of people enrolled in the courses, students not enrolled in any courses with the instructor have their access to the site removed at the end of the semester. While the instructor was still able to pull overall data regarding posts to the discussion board, including the number of posts sent each day and overall number of posts in a given window of time, individual number of posts uploaded by each unique student are unable to be tracked for the fall 2014 group. Therefore, measures of significance listed in the hypothesis cannot be calculated without being able to first calculate the standard deviation (which requires the number of posts per user). Despite the fact that the mean number of posts per student increased from the fall of 2014 to the fall of 2015, hypothesis #2 is unable to be accepted or rejected due to the inability to gather the data needed to measure significance.

Student Perceptions of the Effectiveness of the Use of Twitter

To analyze student perceptions regarding the effectiveness of Twitter as an educational tool, students were given pretests and posttests, one on the first day of class and one on the last day of class. These surveys were designed to measure hypothesis 3: Utilizing Twitter in an Advanced Sociology course will influence student perceptions of the validity of Twitter's usage as an educational tool in a positive manner. The survey was set up in three sections. The first section involved questions designed to determine students' familiarity with discussion boards, Twitter in general, and student access to technological tools, such as a smart phone and a computer with internet at home. Results of this section of the survey are summarized in Table 3 and Table 4.

Table 3

Student usage and access – Twitter, discussion boards and electronic tools

	Pretest		Posttest	
Question	Yes	No	Yes	No
Have you used Twitter before taking this course for any reason?	33	9	30	11
Have you used Twitter before in a different class?	2	40	2	39
Do you have a smartphone?	41	1	40	1
Do you have a computer at home with access to the internet?	41	1	41	0
Have you used discussion boards online previously for any reason?	23	19	20	21
Have you used discussion boards online previously for a class?	22	20	19	22

As shown in Table 1, there were 42 students who elected to participate in the study, with 1 student dropping out of the student because the student moved. The study included 13 males and 29 females (28 at the end). Twenty-two of the students were juniors and twenty (19 at the end) were seniors in high school.

Overall, the students generally were connected with technology personally and at home, as demonstrated in Table 3. The vast majority of students had access to smartphones, with every student except one indicating that they had a personal smartphone. Furthermore, in the pretest only one student indicated that they did not have access to a computer with internet at home, while in the posttest every single student indicated that they had access to a computer with interact access at home.

In regards to the utilization of discussion boards, about half of the students had indicated that they had used discussion boards in any course previously. This matches typical practice among teachers and students in courses in the school district in which the study took place. The usage of Twitter was not nearly as widespread previously for the students. While many of the

students had utilized Twitter for any reason prior to the course (33 indicated they had), only 2 stated that they had used Twitter in a class before. This trend was also representative of the recent practice of teachers in the school district.

Two questions that were insightful for comparison regarding the usage of Twitter were the following: "In the past month, how many days did you check Twitter using a smart phone," and "In the past month, how many days did you check Twitter using a computer." This data is summarized in Table 4.

Table 4

Mean daily usage of Twitter

	Pretest	Posttest
In the past month, how many days did you check Twitter using a smart phone?	12.07	20.17
In the past month, how many days Did you check Twitter using a computer?	0.738	3.20

As shown in Table 4, students' usage of Twitter increased during the study, which was expected because of the requirement to complete discussions on Twitter. A point to keep in mind in the data is that a few students on the survey wrote words instead of numbers for this response. For example, in the pretest, 3 students wrote "everyday" in the box instead of a number and one student wrote "all of the days." The researcher coded word responses that meant all as the number 30. If the students had written 31 instead, the mean number of days checked would have increased slightly. Similarly, a handful of students wrote words instead of numbers for this field in the posttest. "All" was listed twice, with two responses of "every day," which was also coded as 30 days.

Part 2 of the pretest and posttest included 13 questions assessed using a five point Likert scale. This section was designed to assess a variety of student viewpoints related to how effective Twitter in general and technologically based tools specifically are viewed as educational tools. The 13 questions that were asked were the same in substance in both the pretest and posttest. Wording on some of the questions was changed to reflect correct tense and timing of the survey. For example, the fourth question in this section on the pretest was worded as follows: "I believe Twitter will help me to keep track of the course schedule." The corresponding question on the posttest was worded "I believe Twitter helped me to keep track of the course schedule." Results from this section of the surveys is summarized in the following tables.

In part 2 of the survey, students were given the same statements (or slightly reworded statements to reflect future or past tense) and asked to rate, on a five-point Likert scale, whether they strongly disagreed, disagreed, were neutral, agreed or strongly agreed with a series of statements. To perform the statistical analysis, the statements were coded from a 1-5 (1 for strongly disagree, 5 for strongly agree). The statements fit into one of three categories which were grouped into subscales: beliefs about using technological tools in general in education, beliefs about using Twitter specifically in education, and perceptions about skills related to technology. In the data analysis portion of these questions, the analysis includes mean responses pretest and posttest, as well as calculations for statistical significance of the subscales. In all of these questions, measures of significance were calculated at the 5% level using a two-sample *t*-test assuming unequal variances. Furthermore, mean scores for each of the 3 subscales were calculated, followed by a *t*-test comparing pre and post results for each category of question. Lastly, Cronbach's alpha for each of these subscales was calculated to test for adequate

reliability. Results for this analysis are summarized in table 5, and discussed in the sections that follow.

Table 5

Summary of subscale means

Subscale	Pretest	Posttest
Usefulness of technology in general (3 items)	3.96	4.07
Usefulness of Twitter in education (6 items)	3.83	4.17
Perception of technological skills (4 items)	4.30	4.39

Student Perceptions Regarding Technology Uses in General in Education

The subscale regarding student perceptions concerning the utilization of technological tools in general in education consisted of three items total, with Cronbach's alpha for the pretest and posttest being .69 and .78, respectively. The overall subscale pretest mean was 3.96 and the posttest mean was 4.07, showing an improvement in subscale score, but a paired samples *t*-test found no significant difference between pre and posttest ($t = -0.57$; $p = 0.28$). Despite there being no significant improvement in subscale means from the pretest to the posttest, mean scores indicated that most students agreed that technologically based tools are useful in education in general.

Student Perceptions Regarding Twitter in Education

The subscale related to the perception of Twitter pretest consisted of 6 items ($\alpha = .71$), while the perception of Twitter posttest also consisted of 6 corresponding items ($\alpha = .88$). The general trend in these questions initially was a positive view of Twitter (subscale mean = 3.83) with some indecision. This was probably due to a large number of students indicating that they had not used Twitter as part of a class prior to this semester. By the end of the study, students'

perceptions were overall positive regarding the usage of Twitter in education (subscale mean = 4.17). Furthermore, the change in subscale means from the start of the study to the end suggested a statistically significant difference in student perceptions (t = -2.26; p = .01), indicating a positive shift in perceptions of the effectiveness of Twitter over the course of the study, as well as a generally positive view of the applicability of Twitter to an educational environment.

Student Perceptions Regarding Their Technological Skills

The perception of technological skills subscale included four questions specifically designed to see how strong students believed their technological skills were in general, and also related to using social media in particular. The technological skills subscales were both found to be highly reliable (pre α = .75; post α = .84). The trends in this section of questions were similar to the trends we saw in the previous two categories of questions: more neutral and mixed results in the initial survey, and a general shift towards more positive views in the final survey. Prior to the study, student mean perceptions of their technological skills on this subscale were high (4.30). Afterwards, student perceptions on this subscale not only remained high but also increased to 4.39. However, these increases were not statistically significant on this subscale (t = -0.55; p = .29). Regardless of the statistical results, the mean subscale scores indicate that students believe in their abilities to use technologically based tools.

Open Ended Questions

Part 3 of the survey included five open ended questions designed to provide more specific insights into what specifically influenced students' beliefs related to the usage of Twitter as an effective educational tool. While previous questions provided quantitative data which is useful for identifying general trends, the following qualitative data provides extra insights into the

specific reasons as to why students generally answered the way that they did. As in the other data listed above, this data includes pre and post questions which are the same in nature, but involve changes in wording to address correct tense. In analyzing this data, the researching grouped responses by answer type to attempt to identify trends. For example, if students mentioned words such as "speed," "efficient," "quick," and "fast" in there answer for potential benefits in using Twitter, the researcher counted those responses and grouped them together to identify trends.

Question 1: "In your opinion, what do you think will be some benefits of using Twitter for education? Explain…" (Pretest wording) and "In your opinion, what were some benefits of using Twitter for education? Explain…" (Posttest wording).

In reading through the responses that students gave to this question, a variety of responses were present. However, a few themes emerged. Namely, students identified interacting with their classmates and efficiency as the two largest benefits related to Twitter. Sometimes these topics were mentioned separately (e.g. "Quick + easy to use; Hearing other opinions; I was able to read some of the people's opinions; If you miss a day it will be easy to make up because you can tweet almost anywhere; The ability to use it on a smartphone made it more convenient; Less actually handing in papers"; etc…), but frequently they were mentioned together (e.g. "Interacting with other students & being able to have what we need on our phones; Interacting with classmates will be easy when they show up on my feed. Hashtags make finding the topic easy; It was easy to see what other students thought about the music videos. Also, it was really easy to reply; I think that it will be easier to interact with fellow peers when we are not together as a big group").

For example, categorization of the students' responses demonstrated 26 (in the pre) and 23 (in the post) mentions of something related to improving the ability to interact with other students. A number of students mentioned interaction and communication in general (e.g. "Interaction w/peers quickly + easily" and "helped to develop good discussions"), while a number of students identified the broadening of the class environment and interaction as a benefit of using Twitter (e.g. "We can communicate with classmates outside of class"). One comment in the posttest was especially insightful in this regard: "Twitter allows for the education to expand outside of the classroom. Peer interaction with the course work is just as important as learning the material from the teacher and Twitter allowed this dynamic."

The other type of comments that were common in both the pre and post survey regarding perceptions on the benefit of using Twitter were comments related to the ease, quickness or efficiency of Twitter, with 30 comments related to this in the pre survey and 20 comments related to this in the post survey. Comments related to this type of benefit specifically mentioned speed (e.g. "It is ready to be used when needed;" "faster way of communicating;" "faster responses, if somebody agrees or wants to add to what you said its instant"; and "I believe Twitter is beneficial because if I needed to ask Slocomb something it's faster than anything else.") While there were a large number of students in each survey that mentioned speed and efficiency in general, there were ten less mentions of speed and efficiency in the post survey than in the pre survey.

There were a variety of other comments in the survey about the benefits of using Twitter. These included comments related to receiving course updates (4 in each survey), such as "we will get updates on assignments that are due," "you are able to keep in track (sic) of what assignments need to be done," "it is a good way to stay up-to-date with the class" and "you

tweeted things related to the tests/quizzes which were helpful in reviewing." Additionally, there were comments related to the ability to get insights and feedback from the instructor (3 in the pre and 5 in the post survey), such as "we could get ahold of you with questions," and "if your teachers have a twitter account, you will be able to get in touch with them a lot more easier (sic) then (sic) via email."

Question 2: Pretest - "In your opinion, what do you think will be some challenges of using Twitter for education? Explain…" and Posttest – "In your opinion, what were some challenges of using Twitter for education? Explain…"

In the second question from the open ended survey, there was less agreement among the students about what the main challenge would be regarding using Twitter, although there were some trends. For example, in the first question regarding benefits, the two types of comments that were the most common (i.e. increased efficiency or speed, and communication or interacting) had over twenty related comments each in the pre and post survey. However, in this question the two most commonly mentioned challenges (Twitter related challenges and technology related challenges) had 15 or less mentions and there was much more variety across all of the mentions.

Students mentioning challenges related to using Twitter specifically for discussion cited concerns regarding the setup of Twitter. Twitter limits the number of characters to 140 per tweet, which many students cited in the pretest (e.g. "The limited words/letters used and trying to sum it all up," "Sometimes twitter doesn't always work how you want it to. The character limit might impose on all you want to post," "The only problem I see is not being able to express full opinions because of the character count limit," etc…). The other comments of the 15 in the pretest that mentioned Twitter mentioned how not all students are "comfortable" using Twitter,

how their will be a learning curve for some students that may be "rocky," and that "Twitter was not created for classroom use, so there will be issues stemming from that."

Interestingly, there were overall less negative comments about Twitter itself in the post survey regarding the question associated with challenges using Twitter (from 15 post to 10 posts in the final survey). Most of these comments mentioned the limited characters, such as that the 140 character limit made it "annoying to explain concepts," and that they only challenge was trying to get across your opinions "within the character count." Other comments in this section also address issues mentioned previously, including that it was a problem if you forgot the specific class hashtag, or that "Twitter was not designed for this purpose, and it occasionally shows."

The other category of responses that were the most common in the pre and post survey included responses that were related to technological issues in general. The comments mentioned how "technology is not always reliable," and how the internet or Wi-Fi connection is not always stable. Much of this area of focus centered on the specific signals in the school district where the study was carried out. Students commented in general that the internet in the school was not consistent, which some comments being more specific and emotional, such as commenting that the wireless access in the school was "horrendous," that it "sucks," and responding **"(NAME OF THE TOWN) INTERNET"** (emphasis added by the student) to demonstrate frustrations with access to a consistent signal. However, in the pre survey 4 students stated that they had foresaw no issues, and at the end 6 students commented that they had no major challenges while implementing Twitter in their course as part of this study.

Question 3: Pretest - "In your opinion, will you enjoy using Twitter in the course? Explain…" and Posttest – "In your opinion, did you enjoy using Twitter in the course? Explain…"

In asking the students if they would enjoy using twitter or not there were understandably more students that were unsure or neutral at the start of the study than at the end. Of the 41 responses in the pre survey, 27 students thought that they would enjoy using twitter, 3 stated they thought they would not enjoy using twitter and 11 were unsure. In the posttest, 35 students said they enjoyed using Twitter, 4 were neutral and 1 said they disliked using Twitter. As stated previously, 1 student moved after 3 weeks of class which accounts for the differences in total number of responses. In each survey, one student left this section of the survey blank.

In the student explanations as to why they liked or thought they would like using Twitter there were a few trends. First of all, similar to question number one, many of the students mentioned something about speed and efficiency as a reason they enjoyed using Twitter. Comments such as the material being "easy to discuss," being able to "get assignments done faster," and "I finished things more quickly and efficiently!" were common in the discussion. Furthermore, there were a number of comments related to being on Twitter anyways as part of a student's daily routine allowing for a simple way to track and be sure to finish assignments. In this regard, comments such as "I use it every single day to keep connected with people," "I like twitter + (sic) I am very familiar with how it works," and "I did not mind using Twitter. I enjoyed it more than I would have if we had to do discussion on the wiki" were indicative of Twitter being a viable alternative, at least to some students, to utilizing a traditional online discussion board.

While Twitter itself was a benefit in many students' minds, a number of students who indicated that they were neutral or that they disliked utilizing Twitter cited difficulties with Twitter itself as being the primary reason. While this was more common in the pretest, enough students mentioned it that it is important to address. Comments such as "I hope to enjoy using twitter (sic) but I am not a big fan of twitter (sic)," "Twitter is somewhat annoying/confusing," and "I think the cons out-weigh the pros though" indicate that difficulties with Twitter should be considered in classroom utilization.

Question 4: Pretest and Posttest - "In your opinion, what are some of the benefits of using technology based tools for education in general?"

In the responses from the students regarding the benefits of using technological tools in general, many of the responses echoed responses to the first question regarding the benefits of using Twitter specifically. The most commonly cited potential benefit in the students' minds was an improvement in ease, convenience, and efficiency. While benefits related to efficiency were the most commonly cited strengths regarding using technological based tools in general, comments were more diverse in regards to technologically based tools in general compared to Twitter.

Related to potential improvements in efficiency regarding technological tools in general, there were 15 comments (pre) and 19 comments (post), which included statements such as "I think it makes learning & teaching easier for students & teachers," "It is easy and consumes less time," "that you have a multitude of resources at your disposal in a matter of seconds," and, simply stated, "efficiency" were frequent. As stated previously, this re-emphasized comments regarding the potential benefits of using Twitter, which had 30 comments in the pretest and 20 comments in the posttest that mentioned this potential improvement.

The type of comment that was mentioned the second most often in regards to the benefits of using technological tools in general related to technology being relevant in the modern world and students being used to using technology. Twelve comments related to this were mentioned before the study, with 15 similar comments after the study. Many of these comments stated generally that students were used to technology because it is integrated into their lives (e.g. "Since we live in a time where everyone has technology, we are more use (sic) to screens on phones then (sic) we are boards and paper," "Our generation is much more technology based," "Most people use technology," and "technology is very popular with our age."

Many of the comments regarding technology being relevant to this generation had either implicit or explicit messages about technological tools not being as boring as utilizing a more traditional approach in the classroom. Comments such as "some kids prefer technology over boring note taking or worksheets. I personally think its (sic) more fun" directly addressed the perception or traditional methods not being interesting. Other comments, such as "many students could not live without technology so this might get them interested in school," and "students are constantly addicted to technology, so using it in the classroom will help them stay engaged" also implied that methods and tools more commonly utilized in the past can be not as engaging to students.

Lastly in this section, the third most common response, while small, was perceptive and showed that at least some students are more future-oriented than many would expected. Four comments in both the pre and post survey mentioned that learning to use technology will help students to prepare for future. These comments included "using technology helps prepare students for the future, for knowledge of technology will be key for many people and their careers" and "it teaches us how to use and communicate with technology which we will need to

do in college and future jobs" demonstrated that at least some students perceive using these tools as helpful in preparing them for the future from a skill standpoint, not just as a means to learn the material related to the course.

Question 5: Pretest and Posttest – "In your opinion, what are some of the challenges of using technology based tools for education in general?"

When responding to questions about challenges related to the utilization of technologically based tools in general, students identified a number of variables that are not uncommonly associated with challenges toward adopting technologically based methods and tools to improve student learning. The most commonly mentioned concerns related to technologically based tools in general include problems with the functionality of the technology, accessing the technology, not liking or understanding the technology, and the technology providing unique opportunities to be distracting. Further breakdown of the comments shows that technological issues can be a substantial barrier to effective utilization of these types of tools, regardless of the specific type of tool chosen.

Easily the most commonly mentioned concern by the students regarding using technologically based tools was problems with the tool not working. There were 19 comments related to this in both surveys. Many of these comments related to technological problems in general (e.g. "Technology doesn't always work," "technical difficulties," "All technology can malfunction," and "Technology doesn't always work right"). Additionally, many of the comments mentioned concerns with technology in the specific school district not working, such as "The school network," "Internet here is sketchy," "The technology doesn't work inside the school all of the time," and "things not working (the school name) wifi sucks." These comments show the importance of making sure that alternative plans are made when implementing any

technologically based tool in education, as well as the important of testing out any tools to troubleshoot any potential problems.

Another concern that was mentioned frequently included concerns related to access issues, with 10 students in the pretest and 12 in the post survey mentioning concerns related to being able to get access to the technology when it is part of the lesson. These comments related to access at home in general (e.g. "Students who don't have access to the internet," "Some students may not have access to it at home which can make homework hard," "Not everyone has equal access," "Not everyone has access at home," etc.…) and access to smartphones in particular (e.g. "Not everyone has access to smartphones/other devices," "Not everyone has a smartphone," "Some kids don't have smartphones," "some may not have a phone at all," etc.…). As expected, these comments show the need to give students who have challenges getting access to technology with a viable alternative to complete the assignments and engage in the learning.

Additionally, a number of students mentioned that not liking or understanding how to use the technological tool can be a large barrier towards implementation of technologically based tools. These comments (numbering 10 in the pretest and 7 in the post survey) include "it can be utterly confusing," "Some people don't know how to use them," "technology can be hard to use," and "technology is not reliable and is confusing to some people." These comments demonstrate the need to take the time to teach students how to use any tool if using that tool is an expectation in the course.

Finally, in regards to challenges with implementation of technology in an educational setting, a number of students (12 in the pretest and 5 in the posttest) mentioned that technology presents a unique temptation for students to be distracted while learning in any course, as well as concerns related to using the technology inappropriately. Students mentioning distractions

largely mentioned issues related to inefficiency due to the distractions, such as “getting everyone to focus and participate in the activity,” “The ability to side track yourself with games,” and “kids may end up getting distracted on their phones.” In the case of inappropriate usage concerns, student comments included “people abusing the technology,” “others could misuse technology during class for non-school purposes,” and “there are some creapy (sic) online people out there!” These comments demonstrate the need to implement safe guarding procedures including having students set good passwords, modify security settings, and using unique school based accounts to minimize concerns related to abuse.

CHAPTER 5. SUMMARY, CONCLUSION, DISCUSSION, RECOMMENDATIONS

In this section, a summary of the study will be followed by the conclusions found by the researcher, including a discussion of the specific results of the study and additional recommendations regarding further areas of study and recommendations for practitioners.

Summary

The discussion regarding exactly how much social media in general, and Twitter in particular, should be utilized in the secondary classroom is far from over. Regardless of what tools are specifically utilized, the nature and structure of schools are changing from what was classroom centered to a learning environment where students can learn anything, anywhere, at any time through 21st century tools and technology. Twitter is a tool which, if leveraged correctly, can be utilized to enhance learning in the classroom and extend learning to outside the classroom walls. While there are a number of strengths and weaknesses related to any technological tool, a growing body of research suggests that, when implemented correctly, Twitter and other types of social media can be effective educational tools. Twitter usage in and of itself may not provide more benefits than other technologically based tools, but it may provide a viable alternative that allows for student interaction and learning utilizing a tool that many of them have access to nearly constantly. School districts broadly, and teachers particularly, that choose to leverage Twitter in their classrooms will need to ensure that they prepare and encourage stakeholders to use Twitter, anticipate potential problems tied to the specific set up of Twitter, consider technological roadblocks related to using Twitter (such as access and functionality), and provided stakeholders with viable alternatives to Twitter to accomplish similar tasks.

Findings

Based on the data collected over the course of the study, including data comparing mean class grades, number of discussion posts, and survey data (including quantitative and qualitative data), Twitter appears to be a viable alternative to other platforms utilized to implement blended learning, but not necessarily superior to those platforms, at least in regard to improvement of student grades. The two groups of students were similar in mean GPA composition (3.41 fall 2015; 3.36 fall 2014) but demonstrated similar performance in the class when using Twitter instead of online discussion boards in the course. While mean student grades from the fall of 2014 group (85.3%, which used an online discussion board) were higher than mean student grades from the fall of 2015 (84.5%, which used Twitter for discussion), the scores were close, and the difference in mean scores was not statistically significant (t = -0.44; p = 0.50).

Furthermore, Twitter appeared to be a platform that encouraged more student engagement. When comparing the sheer number of posts, despite being graded using the same rubrics with the same expectations regarding the number of posts, and despite having 16 less overall students, the students in the Twitter group posted 395 more times than the students in the previous group that posted on an online discussion board. This resulted in a mean number of posts for the fall 2015 group of 42.29 posts per student, whereas the fall 2014 group had a mean number of posts of 23.49, an increase of number of posts by approximately 80%. Gallup's survey regarding school effectiveness found that over 80% of the public and 80% of the chief state leaders in education identified engagement as one of the most important indicators of student success (Calderon & Hodges, 2016), so this apparent improvement in student engagement was good to see. However, as stated previously, limitations with the tool utilized prevented more complex and definitive analysis from being conducted.

Finally, student perceptions of Twitter as an educational tool were largely positive, both before and after the study. After the study, positive responses generally increased, with 11 of the 13 statements seeing a larger number of positive comments (i.e. agree and strongly agree) than in the survey conducted at the beginning of class. Additionally, on the subscale of Likert questions related to Twitter specifically, student mean responses increased from 3.83 to 4.17, which was statistically significant (t = -2.26, p = .01). Furthermore, qualitative data collected from the students indicated generally positive comments, with many students indicating that Twitter provided a quick and efficient means to stay connected with other students in the course, the instructor and to learn the material. Comments that were negative generally discussed concerns with technological problems, difficulties related to the setup of Twitter, and individual student preferences (such as disliking technological tools or Twitter itself).

Conclusion

Information obtained in this study included both qualitative and quantitative data. When comparing two samples of students with similar compositions (e.g. tests, assignments, notes, books, instructor, GPA's which were statistically similar, and in the same schools), final overall course grades were similar, the mean and total number of discussion posts increased, and perceptions regarding the effectiveness technological tools in general, of Twitter specifically, and of student technological skills in general increased from the initial to the concluding survey. All of these results indicated that students mean responses on these subscales were positive, with the Twitter subscale increasing at a statistically significant level, with mean scores increases from 3.83 to 4.17 (t = -2.26; p = .01). In the case of the final overall grades, mean non-weighted GPA for the fall 2014 students was 3.36, while mean GPA for the fall 2015 students was 3.41, which did not demonstrate a statistically significant difference. Regarding the number of student

posts, the implementation of Twitter seemed to encourage this with the group utilizing Twitter posting 80% more than the other group of students despite having fewer overall students, but further analysis was limited due to the nature of the platforms utilized. Finally, surveys indicated generally positive responses to using Twitter and generally improved perceptions regarding Twitter as an educational tool from the pretest to the posttest.

Research question 1: To what degree does incorporating Twitter in a high school Advanced Sociology course influence student performance as measured by whole class average? The data comparing student performance in courses while utilizing Twitter was mixed. While the hypothesis related to research question 1 was rejected, and while mean grades in the Twitter group were lower, the decrease in mean grades was 0.9%, which was not statistically significant. Therefore, it could be argued that Twitter is a viable alternative to discussion boards as a tool for blended learning to encourage and facilitate student involvement in a course outside and during class time.

Research question 2: How does the incorporation of Twitter into a high school Advanced Sociology course influence student engagement in online discussions as measured by average number of posts per student? As stated previously, these data were unable to be calculated because of a difficulty in accessing previous individual student data that made calculating standard deviation impossible. This, in turn, made conducting a *t*-test impossible, which resulted in the accepting or rejecting of hypothesis 2 being impossible. Mean number of student posts using Twitter was higher (42.29) than in the comparison group (23.49). This probably was due to one of a number of factors: the convenience of being able to post on Twitter using a smart phone, the novelty factor of the tool of Twitter, the prevalence of student smartphone ownership, and the character limitations of Twitter posts. Because of this,

conclusions regarding research question 2 are difficult to draw, but students seemed to be more engaged overall based on the sheer number of posts and data obtained from the surveys, at least if engagement in measured using sheer number of posts and frequency of interacting via a specific medium for learning.

Research question 3: To what degree does the incorporation of Twitter into a high school Advanced Sociology course influence student perception regarding the usage of Twitter as a viable education tool? As shown in the previous sections, student perceptions of Twitter in education consistently improved and the amount of that improvement was noticeable and statistically significant on the Twitter subscale. Other subscales showed improvement as well, but the improvement in those subscales was not statistically significant. While student beliefs about the effectiveness of an educational tool do not automatically mean that a tool is an effective educational tool, the student perception of that tool is likely to have an influence on whether or not students would use that tool. As such, the results of this study are encouraging in regards to the viability of Twitter as an educational tool.

Discussion

The results of this study were not surprising given the review of the literature and expected outcomes. While the researcher expected to see a statistically significant increase in mean course grades when implementing Twitter (largely because of the convenience and efficiency that the students frequently mentioned in the survey), mean grades stayed the same at a statistically significant level. This differed from some other similar research, namely Junco, Helberger, and Loken (2011), who found a statistically significant increase in student engagement and grades when using Twitter instead of an online discussion board (Ning in the case of that particular study) in a college course. However, the results of this study show that

Twitter at least is a viable alternative as it relates to influencing learning since grades stayed the same at a statistically significant level.

In terms of discussion posts, it was not surprising to see more posts completed when using Twitter (as was the case for the 2015 students) instead of the online discussion boards (as was the case for the 2014 students). This was expected in part because of the prevalence of smart phones and the efficiency in accessing the material and discussions via Twitter on a smartphone versus a discussion board. Students have the ability to access Twitter with one button press and no entering of a username or password if the settings are set to save username and password on a student's personal smartphone. This in and of itself, combined with the fact that nearly all of the students who participated in the study indicated that they had a smartphone, and therefore had 24/7 access and the ability to submit discussion posts, lends itself well to increasing student engagement in this way.

However, some confounding variables could influence the amount of student posts. Students who posted on the discussion board in the past could have posted much more thorough responses because the discussion boards do not limit text in the same way Twitter does. Furthermore, the settings of the website which host the discussion board used in the course limit ability to track individual student posts, which made statistical measurements difficult to accomplish. Regardless, even without ways to assess this and with the limited number of characters, a mean number of posts per student greater than 40 related to the course was an important number of posts. In the view of the researcher, this suggests that the utilization of Twitter is a potentially exceptional way to increase student involvement and engagement in the course.

Were this study to be completed again, the researcher would test out a number of technology tools that could be used to track Twitter in much more depth before starting the study. Tracking and using Twitter was a very time consuming process for the researcher. Had the researcher been more familiar with some of the tools that could be used to make Twitter discussions easier to follow, the implementation of Twitter in the course for the researcher would not have been as labor intensive and potentially could have improved the experience for everyone involved with the study.

Finally, in the analysis of the survey a few trends were prevalent. First, a clear majority of the students in the study had an overall positive view of technology in general, and Twitter in particular regarding, educational uses. Part 2 of the survey, which asked students to rate on a 5 point scale a variety of statements related to technology, Twitter and learning, showed largely positive perceptions in both the starting and concluding surveys. Mean response scores in almost all questions increased from the start of the semester to the end of the semester, with the Twitter specific question subscale means (consisting of 6 questions) increasing by a coded value of over .33, which was statistically significant. The number of students stating that they disagreed or strongly disagreed with the statements present in the survey was consistently small, with some questions receiving none of these responses and a number receiving 4 or less of these responses which would indicate negative perceptions. Even the question which had the highest number of negative responses had 8 total negative responses, which represented less than 20% of the sample and was the exception rather than the rule when it came to response patterns.

Perhaps the most directly relevant and insightful data gleaned from this study came in the post surveys in the questions related to Twitter specifically. One of the questions asked students to comment on if they enjoyed using Twitter and to explain why or why not. Thirty-five students

stated that they enjoyed using Twitter, 4 students gave responses which were neutral or which weighed the pros and the cons roughly equally, and 1 student stated that they disliked using Twitter. Comments such as "Yes, I finished things more quickly and efficiently!," "Yes, because it made learning easier," and "Yes, (Twitter) helped me understand the concepts better" were prevalent in this question. Furthermore, in the question related to the benefits of using Twitter for education, students emphasized the social element of Twitter. As a tool designed to help people interact more quickly and efficiently, comments such as "I could respond to my classmates and learn from them," "communicating with the teacher and the students was really easy," and "it helps you interact with people" were not surprising related to Twitter.

Recommendations

In the analysis of data obtained through this study, a few trends became clear regarding what types of studies would help add to the knowledge base regarding using Twitter in education. Furthermore, a number of recommendations for teachers, administrators and other educational practitioners who chose to implement Twitter became evident. In the following section, some relevant suggestions for future study will be listed first, followed by suggestions for educational practitioners (largely teachers) who are considering using Twitter in their classrooms.

Recommendations for Further Study

As in many pursuits of knowledge, what starts out as being a pursuit of answers to questions actually turns into situations where one ends up with more questions than answers. In the case of this research, a few questions which other researchers could address that would help expand the field (and answer the questions which kept coming up in the researcher's mind) would be questions regarding school policies and procedures related to Twitter usage, methods

and tools which could be used to effectively track student usage of Twitter, and larger scale studies in secondary schools specifically addressing the influence of Twitter on engagement and grades would help to shed more light on the effect Twitter can have in education.

School policies and procedures

Future study regarding district polices related to the usage of Twitter would shed some light on how widely Twitter is utilized in secondary schools. School districts develop policies and procedures to do many things, including to ensure the safety of their students. Because of this, a number of school districts block social media tools such as Twitter (Kist, 2013) (in the school district in which this study was carried out, Twitter started being blocked over the student Wifi accessible with student devices starting in January 2016, but was still accessible via school computers). The privacy concerns are real and noticed by students in both this study and other studies. Some students in this study commented that "people using it in an appropriate way could be challenging" and "there are some creapy (sic) online people out there!," which reflected concerns of privacy. In a previous study, one quote from a student interviewed after the study was especially insightful and reflective of concerns that many schools have regarding social media:

> The intrusive nature of some social networking/media sites introduces issues that go beyond the course. Google, Facebook, and Twitter all sell user information and anyone who has not noticed that the ads that pop up on web sites generally reflect your recent searches or shopping isn't paying attention (Blaschke, 2014, p. 17).

Methods and tools to track student usage

This study had students utilize Twitter instead of an online discussion board for a blended learning model. The method the instructor utilized to track student usage of Twitter involved

setting up a column for each student in the "Tweetdeck" Twitter management tool. The instructor consulted with a variety of technological professionals prior to beginning the study and they recommended this tool as being the most efficient tool to manage Twitter that they had heard of other teachers using. Still, just setting up the columns for each student took three or four hours total, and then tracking the students comments took hours and hours over the course of the semester. While no specific total was calculated, the time was substantial. Other researchers (Blaschke, 2014) found similar trends, with instructors commenting that tracking student usage of social media tools was "very time-consuming."

Larger studies in secondary schools

A final suggestion for future research which would provide some insights regarding the usage of Twitter in secondary schools would be larger, more diverse studies. A weakness with this research was the limited scope and sample size. A larger sample with randomly assigned students and instructors in a required course would be insightful in determining the role Twitter plays in influencing student engagement and learning. This larger sample may be difficult if not impossible to find because of a tendency for teachers to fall into two camps regarding their view educational technology: that it is powerful for student learning or that it is excessively distracting (Manzo, 2009).

Recommendations for Educational Practitioners

When choosing to implement any relatively new educational intervention there will always be some unforeseen and unintended consequences which can get in the way of effectively implementing that specific initiative. By researching other similar technologies and interventions, educators can anticipate potential problems and learn from the mistakes of others to make their intervention more effective. Educators looking at this specific research, as well as

information contained in the literature review, could draw from the knowledge gained by this research to improve their individual practices. Specifically, this research shows that educators seeking to implement Twitter would be wise to anticipate and attempt to mitigate potential technological obstacles, be aware of the strengths and weaknesses of the platform itself, and be sure to have a systematic and consistent way to utilize Twitter in class.

Technological obstacles

While Twitter showed potential to be an effective educational tool, there are a few obvious obstacles tied to relying on Twitter, as in any technological tool. The first and most obvious example when choosing to use any technological tool is that it could malfunction. If educators are planning on using Twitter for an educational tool, they should check to make sure their school system has the capability and is willing to support Wifi access on student devices, or the educators should assess the scope and access to district own technology tools. By having a district technological infrastructure that is capable of handling access for student devices, as well as a school which is supportive of technological tools, a specific technological intervention will be much more likely to succeed. Technological obstacles was one of the main concerns listed in the open ended responses by the students in this study, and was mentioned in previous research (Bull & Adams, 2012).

Another technological obstacle which must be considered is a lack of access that students may have due to socioeconomic factors. While in this study the vast majority of students had access to a smartphone, there still was one student who did not, and while he/she had access to a number of computers in the school library during his/her open period, the convenience differences could adversely influence how the student was able to perform or engage in the class.

Twitter specific challenges

Twitter, as in any tool chosen for learning, has a number of specific strengths and weaknesses. Educators seeking to implement Twitter in a secondary school would be wise to consider these strengths and weaknesses before determining if Twitter would be an effective tool in their classroom in the first place, and, if they choose to use Twitter, those strengths and weaknesses should be accounted for while planning the course.

First, as in any technological tool, just learning how to use the tool for the first time can be an obstacle related to implementation. In the open ended questions in this study related to Twitter, some students mentioned that they were not that familiar with Twitter and therefore had problems. Furthermore, a variety of the colleagues of the researcher commented on how they did not want to learn how to use the tool because they already have a variety of new things to learn each year in their job.

If a teacher chooses to implement Twitter, a number of things are essential to ensure the safety of their students. First, parents should be involved, including explaining to them the purpose of using Twitter and safeguards that have been put into place regarding the learning activities related to Twitter (Kist, 2013). Second, school policies and procedures should be explored thoroughly before implementing Twitter. In the case of this study, some school district changes (such as blocking Twitter on student devices through the school Wifi) required the researcher to adjust plans accordingly. Additionally, while most students in this study now had access to cell phones and various devices, there are still some students for whom accessing technological tools could be a challenge due to socio-economic status. Therefore, teachers should come up with alternate plans for students who are unable to access these tools in the same way as their peers. Lastly, the teacher should research tools to make the implementation and

tracking of Twitter less time intensive. As the researcher discovered in this study, tracking individual user posts via Twitter is very labor intensive, so planning accordingly and adjusting is wise.

Systematically planning Twitter implementation

Finally, if an educator chooses to implement Twitter in their course, they should have a systematic way in which the students are expected to use the platform. This should be determined by assessing what exactly the objective for using Twitter is in the course. Once the objective is established, a person should become familiar with Twitter (if they are not already) and establish a Twitter account for class, as well as a class hashtag, as suggested by Tyma (2011).

After this, the method of planning and implementing Twitter that the instructor decides to use should be used as a guide in determining the exact techniques to be utilized. Tyma (2011) again has some good insights, such as using Twitter to break down a guest speaker, for class discussion, and for a variety of in-class activities. A related question often is how to assess and/or grade student involvement in Twitter. Here, as in the case of many issues related to grading and assessment, there is some disagreement. Junco, Helberger, and Loken (2011) suggest requiring student participation, while Tyma says it must be optional, and further emphasizes to teachers that they "do not make the mistake of unintentionally shaming students by privileging this technology (and those who are using it) over students who do/cannot" (Tyma, 2011, p. 178). In regards to grading and assessing student involvement of Twitter, the researcher in this study found that assessing was probably the most difficult thing in terms of implementing Twitter.

REFERENCES

Abe, P., & Jordan, N. A. (2013, March/April). Integrating social media into the classroom curriculum. *About Campus*, 16-20. http://dx.doi.org/10.1002/abc.21107

About Twitter. (2015). Retrieved from https://about.twitter.com/

Alias, N., Sabdan, M. S., Aziz, K. A., Mohammed, M., Hamidon, I. S., & Jomhari, N. (2013). Research trends and issues in the studies of Twitter: A content analysis of publications in selected journals. In *Procedia - Social and Behavioral Sciences* (Vol. 103, pp. 773-780). http://dx.doi.org/10.1016/j.sbspro.2013.10.398

Archambault, L., Wetzel, K., Foulger, T. S., & Williams, M. K. (2010). Professional development 2.0: Transforming teacher education pedagogy with 21st century tools. *Journal of Digital Learning in Teacher Education, 27*(1), 4-11.

Balakrishnan, V. (2014). Using social networks to enhance teaching and learning experiences in higher learning institutions. *Innovations in Education and Teaching, 51*(6), 595-606. http://dx.doi.org/10.1080/14703297.2013.863735

Balubaid, M. A. (2013). Using web 2.0 technology to enhance knowledge sharing in an academic department. *6th International Forum on Engineering Education, 102*, pp. 406-420. http://dx.doi.org/10.1016/j.sbspro.2013.10.756

Barone, D. M., & Mallette, M. H. (2013). On using Twitter. *The Reading Teacher, 66*(5), 377-379. http://dx.doi.org/10.1002/TRTR.01138

Bartow, S. M. (2014). Teaching with social media: disrupting present day public education. *Educational Studies, 50*(1), 36-64. http://dx.doi.org/10.1090/00131946.2013.866954

Bassoppo-Moyo, T.C. (2011). How computer science finally got it right for instructional technology and design specialists. *International Journal of Instructional Media, 38, 335-349*

Bergmann, J., & Sams, A. (2012, October). Before you flip, consider this. *Phi Delta Kappan*, *94*(2), 25. http://dx.doi.org/10.1177/003172171209400206

Bicen, H. (2014). Student opinions regarding Twitter usage with mobile applications for educational purposes. *LINELT, 136*, pp. 385-390. http://dx.doi.org/10.1016/j.sbspro.2014.05.345

Blaschtke, L. M. (2014). Using social media to engage and develop the online learner in self-determined learning. *Research in Learning Technology, 22*, 1-23. http://dx.doi.org/10.3402/rlt.v22.21635

Blazer, C. (2012). Social networking in schools: Benefits and Risks; Review of the research; policy considerations; and current practices. Information capsule. In *Miami-Dade County Public Schools: Information capsule: Research services* (Vol. 1109, pp. 1-23). Retrieved from http://www.dadeschools.net

Bonanno, R. A., & Hymel, S. (2013). Cyber bullying and internalizing difficulties: Above and beyond the impact of traditional forms of bullying. *Journal of Youth and Adolescence*, *42*(5), 685-697. http://dx.doi.org/10.1007/s10964-013-9937-1

Bull, P. H., & Adams, S. (2012). Learning technologies: Tweeting in a high school social studies class. *I-manager's Journal of Educational Technology*, *8*(4), 26-33.

Calderon, V. J., & Hodges, T. (2016, January 6). K-12 leaders: Student engagement, hope top measures of a school [Fact sheet]. Retrieved May 30, 2016, from Gallup, Inc. website: http://www.gallup.com/opinion/gallup/ 188012/leaders-student-engagement-hope-top-measures-school.aspx

Carpenter, J. P., & Krutka, D. G. (2014). Engagement through microblogging: Educator professional development via Twitter. *Professional Development in Education*, 1-22. http://dx.doi.org/10.1080/19415257.2014.939294

Carpenter, J. P., & Pease, J. S. (2012, October). Sharing the learning. *Phi Delta Kappan*, *94*(2), 36-41. http://dx.doi.org/10.1177/003172171209400209

Castro, C., & Andrade, A. (2011). Teaching chemistry in a social learning environment: Facing drivers and barriers. *ICERI*, pp. 3377-3385. arXiv:1204.3164

Chang, Y.-K., Morales-Arroyo, M. A., Than, H., Tun, Z., & Wang, Z. (2010/2011). Collaborative learning in wikis. *Education for Information, 28*, 291-303. http://dx.doi.org/10.3233/EFI-2010-0910

Cheung, A. C.K., & Slavin, R. E. (2012). How features of educational technology applications affect student reading outcomes: A meta-analysis. *Educational Research Review, 7,* 198-215. http://dx.doi.org/10.1016/j.edurev.2012.05.002

Civic engagement through digital citizenship. (2012). *The Progress of Education Reform*, *13*(1), 1-6. Retrieved from http://www.ecs.org/per

Cook, G. (2013, October). Ahead of the digital learning curve. *Principal Leadership*, *14*(2), 20-23.

Cooke, M. (2012, Spring). Twitter and Canadian educators. *Education Canada*, 19-23. Retrieved from http://www.cea-ace.ca/educationcanada

Crews, T. B., & Stitt-Gohdes, W. L. (2012). Incorporating Facebook and Twitter in a service-learning project in a business communication course. *Business Communications Quarterly*, *75*(1), 76-79. http://dx.doi.org/10.1177/1080569911431881

Davis, N., Eickelmann, B., & Zaka, P. (2013). Restructuring of educational systems in the digital age from a co-evolutionary perspective. *Journal of Computer Assisted Learning, 29,* 438-450. http://dx.doi.org/10.1111/jcal.12032

Dede, C., Korte, S., Nelson,R., Valdez, G., & Ward, D. (2005*). Transforming education for the 21st Century: An economic perspective*. Chicago, IL: Learning Point Associates.

Dede, C. (2009). Technologies that facilitate generating knowledge and possibly wisdom. *Educational Researcher, 38*(4), 260-263. Retrieved from http://www.jstor.org/stable/20532541

Domizi, D. (2013). Microblogging to foster connections and community in a weekly graduate seminar course. *TechTrends: Linking Research and Practice to Improve Learning*, *57*(1), 43-51. http://dx.doi.org/10.1007/s11528-012-0630-0

Duggan, M., Ellison, N. B., Lampe, C., Leinhart, A., & Madden, M. (2014, January). Social media update 2014. Retrieved April 13, 2015, from Pew Research Center website: http://www.pewinternet.org/2015/01/09/social-media-update-2014/

Dunlap, J. C., & Lowenthal, P. R. (2009). Tweeting the night away: Using Twitter to enhance social presence. *Journal of Information Systems Education*, *20*(2), 129-135.

Ebner, M., Lienhardt, C., Rohs, M., & Meyer, I. (2010). Microblogs in higher education - a chance to facilitate informal and process-oriented learning? *Computers & Education*, *55*, 92-100. http://dx.doi.org/10.1016/j.compedu.2009.12.006

Feliz, T., Ricoy, C., & Feliz, S. (2013). Analysis of the use of Twitter as a learning strategy in master's studies. *Open Learning: The Journal of Open, Distance and e-Learning*, *28*(3), 201-215. http://dx.doi.org/10.1080/02680513.2013.870029

Ferguson, H. (2010, June/July). Join the flock! *Learning and Leading with Technology*, *37*(8), 12-15. Retrieved from http://files.eric.ed.gov/fulltext/EJ886391.pdf

Fincham, K. (2011). Storify. Journal of Media Literacy Education *3*(1), 56-60

Fouts, J. (2012). Pros and cons of social media in the classroom. Online Learning Services, Syracuse University, Syracuse, NY. Retrieved from http://ols.syr.edu/archives/780.

Fulton, K. P. (2012, October). 10 reasons to flip. *Phi Delta Kappan*, *94*(2), 20-24. http://dx.doi.org/10.1177/003172171209400205

Garrison, D. R., Anderson, T., and Archer, W. (2000) Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2-3), 87-105

Goodyear, V. A., Casey, A., & Kirk, D. (2014). Tweet me, message me, like me: Using social media to facilitate pedagogical change within an emerging community of practice. *Sport, Education and Society*, *19*(7), 927-943. http://dx.doi.org/10.1080/13573322.2013.858624

Greenhow, C., Robelia, B., & Hughes, J. E. (2009). Learning, teaching, and scholarship in a digital age: Web 2.0 and classroom research: What path should we take now? *Educational Researcher, 38*(4), 246-259. http://dx.doi.org/10.3102/0013189X09336671

Grosseck, G. (2009). To use or not to use web 2.0 in higher education? *World Conference on Educational Sciences 2009, 1*, pp. 478-482. http://dx.doi.org/10.1016/j.sbspro.2009.01.087

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York, NY: Routledge.

Herbert, M. (2012, April). Why all the chatter about #edchat? *District Administration*, *48*(4), 51-54. Retrieved from http://www.districtadministration.com/article/why-all-chatter-about-edchat

Hew, K. F., & Cheung, W. S. (2013). Use of web 2.0 technologies in K-12 and higher education: The search for evidence-based practice. *Educational Research Review*, *9*, 47-64. http://dx.doi.org/10.1016/j.edurev.2012.08.001

Higdon, J., & Topaz, C. (2009). Blogs and wikis as instructional tools. *College Teaching*, *57*, 105-109.

Hinduja, S. & Patchin, J.W. (2011). High-tech cruelty. Educational Leadership, *68*(5), 48-52.

Hirst, M., & Treadwell, G. (2011). Blogs bother me: Social media, journalism students and the curriculum. *Journalism Practice*, *5*(4), 446-461. http://dx.doi.org/10.1080/17512786.2011.555367

Holotescu, C., & Grosseck, G. (2012). An empirical analysis of the educational effects of social media in universities and colleges. *The 8th International Scientific Conference eLearning and software for Education*, *02*, pp. 156-164. http://dx.doi.org/10.5682/2066-026X-12-117

Huwe, T. K. (2012). Twitter and Facebook open the door to collaboration. *Computers in Libraries*, *32*(8), 27-29. Retrieved from http://www.infotoday.com/cilmag/oct12/index.shtml

Journell, W., Ayers, C. A., & Beeson, M. W. (2013). Joining the conversation: Twitter as a tool for student political engagement. *The Educational Forum*, *77*(4), 466-480. http://dx.doi.org/10.1080/00131725.2013.822039

Journell, W., Ayers, C. A., & Beeson, M. W. (2014, February). Tweeting in the classroom. *Phi Delta Kappan, 95*(5), 63-67. http://dx.doi.org/10.1177/003172171409500514

Judd, B. C., & Graves, C. A. (2012). Cellular STEM: Promoting interest in science, technology, engineering, and math education using cellular messaging, cloud computing, and web-based social networks. *2012 12th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing*, pp. 799-804. http://dx.doi.org/0.1109/CCGrid.2012.111

Junco, R. (2014). *Engaging students through social media: Evidence-based practices for use in student affairs*. San Fransisco, CA: Jossey-Bass.

Junco, R., Elavsky, C. M., & Heiberger, G. (2013). Putting Twitter to the test: Assessing outcomes for student collaboration, engagement and success. *British Journal of Educational Technology, 44*(2), 273-287. http://dx.doi.org/10.1111/j.1467-8535.2012.01284.x

Junco, R., Helberger, G., & Loken, E. (2011). The effect of Twitter on college student engagement and grades. *Journal of Computer Assisted Learning, 27*, 119-132. http://dx.doi.org/10.1111/j.1365-2729.2010.00387.x

Kassens, A. L. (2014). Tweeting your way to improved #writing #reflection, and #community. *The Journal of Economic Education, 45*(2), 101-109. http://dx.doi.org/10.1080/00220485.2014.889937

Kazu, I. Y., & Demirkol, M. (2014). Effect of blended learning environment model on high school students' academic achievement. *The Turkish Online Journal of Educational Technology, 13*, 78-87.

Kennedy, M. (2011, October). Facing the future with education technology. *American School and University, 84*(2), 10-17. Retrieved from http://asumag.com/Construction/technology/social-media-schools-201110

Kim, M., & Cavas, B. (2013). Legitimate peripheral participation of pre-service science teachers: Collaborative reflections in an online community of practice, Twitter. *Science Education International, 24*(3), 306-323. Retrieved from http://files.eric.ed.gov/fulltext/EJ1022310.pdf

Kist, W. (2013). Class, get ready to tweet: Social media in the classroom. *Our Children: The National PTA Magazine*, *38*(3), 10-11.

Knight, C. G., & Kaye, L. K. (2014). 'To tweet or not to tweet?' A comparison of academics' and students' usage of Twitter in academic contexts. *Innovations in Education and Teaching International*, 1-11. http://dx.doi.org/10.1080/14703297.2014.928229

Krutka, D., & Milton, M. K. (2013). The Enlightenment meets Twitter: Using social media in the social studies classroom. *Ohio Social Studies Review*, *50*(2), 22-29

Krutka, D. G. (2013). Democratic twittering: Using social media in the social studies. *The International Society for the Social Studies Annual Conference Proceedings*, *2013*(1), pp. 75-81.

Larkin, P. (2013, April). Tweeting the good news - and other ways to use social media. *The Principalship*, *70*(7), 70-72.

Lin, M.-F. G., Hoffman, E. S., & Borengasser, C. (2013). Is social media too social for class? A case study of Twitter use. *Tech Trends*, *57*(2), 39-45.

Mandviwalla, M., Schuff, D., Chacko, M., & Miller, L. (2013, September/October). Is that all there is? Taking education to new levels in the social-media era. *Change: The Magazine of Higher Learning*, *45*(5), 51-58. http://dx.doi.org/10.1080/00091383.2013.812474

Manzo, K. K. (2009). Twitter lessons in 140 characters or less. *Education Week*, *29*(8), 1-14.

Markham, S. A., & Belkasim, S. (2011). Collaborating across international boundaries...Using Twitter as a tool in the classroom. *ITiCSE 11 Proceedings of the 16th Annual Joint Conference on Innovation and Technology in Computer Science Education*, p. 382. http://dx.doi.org/10.1145/1999747.1999895

Martinez, M., & McGrath, D. (2014, September). Technology alone won't transform teacher to facilitator. *Phi Delta Kappan*, *96*(1), 41-45. http://dx.doi.org/10.1177/0031721714547861

Marzano, R. J., Pickering, D., & Pollock, J. E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement*. Alexandria, Va.: Association for Supervision and Curriculum Development.

McArthur, J. A., & Bostedo-Conway, K. (2012). Exploring the relationship between student-instructor interaction on Twitter and student perceptions of teacher behaviors. *International Journal of Teaching and Learning in Higher Education*, *24*(3), 286-292. Retrieved from http://www.isetl.org/ijtlhe/

McFall, K. S., & Morgan, K. (2013). Stimulating class discussion using an online newspaper created with Twitter and Paper.li. *Communication Teacher*, *27*(2), 85-89. http://dx.doi.org/10.1080/17404622.2013.770158

McLean, R. (2014, January/February). Facebook, Twitter and Pinterest, oh my! Using social media as a professional development tool. *Agricultural Education*, *86*(4), 10-12.

Messner, K. (2009, December). Pleased to tweet you: Making a case for Twitter in the classroom. *School Library Journal*, 44-47. Retrieved from http://www.slj.com/2009/12/technology/social-media-technology/pleased-to-tweet-you-making-a-case-for-twitter-in-the-classroom/#_

Miller, S. M. (2010). Enhancing your Twitter experience. *Learning and Leading With Technology*, *37*(8), 14-17. Retrieved from http://www.learningandleading-digital.com/learning_leading/20100607?folio=14#pg1

Mindel, J. L., & Verma, S. (2006). Wikis for teaching and learning. *Communications of the Association for Information Systems*, *18*(1), 1-23.

Moran, M., Seaman, J., & Tinti-Kane, H (2011). Teaching, learning, and sharing: How today's higher education faculty use social media. Babson Survey Research Group, and New Marketing Labs, Retrieved from http://www.pearsonlearningsolutions.com/educators/pearson-social-media-survey-2011-bw.pdf

Murphrey, T. P., Rutherford, T. A., Doerfert, D. L., Edgar, L. D., & Edgar, D. W. (2012). Technology acceptance related to Second Life, social networking, Twitter, and content management systems: Are agricultural students ready, willing, and able? *Journal of Agricultural Education*, *53*(3), 56-70. http://dx.doi.org/10.5032/jae.2012.03056

Nicholson, J., & Galguera, T. (2013). Integrating new literacies in higher education: A self-study of the use of Twitter in an education course. *Teacher Education Quarterly*, *40*(3), 7-26. Retrieved from http://www.teqjournal.org/

Ozan, O. (2013). Scaffolding in connectivist mobile learning environment. *Turkish Online Journal of Distance Education, 14*(2), 44-55. Retrieved from http://files.eric.ed.gov/fulltext/EJ1013746.pdf

Palmer, N., & Schueths, A. M. (2013). Online teaching communities within Sociology: A counter trend to marketization of higher education. *Teaching in Higher Education, 18*(7), 809-820. http://dx.doi.org/10.1080/13562517.2013.836097

Palmer, S. (2013). Characterisation of the use of Twitter by Australian universities. *Journal of Higher Education Policy and Management*, *35*(4), 333-344. http://dx.doi.org/10.1080/1360080X.2013.812029

Park, S. W. (2013). The potential of web 2.0 tools to promote reading engagement in a general education course. *TechTrends: Linking Research and Practice to Improve Learning, 57*(2), 46-53. http://dx.doi.org/10.1007/s11528-013-0645-1

Petrilli, M. J. (2011, Fall). All a-Twitter about education. *Education Next, 11*(4), 90-91. Retrieved from http://educationnext.org/all-a-twitter-about-education/

Rambe, P. (2012). Constructive disruptions for effective collaborative learning: Navigating the affordances of social media for meaningful engagement. *The Electronic Journal of e-Learning, 10*(1), 132-146. Retrieved from http://www.ejel.org

Redman, C., & Trapani, F. (2012). Experiencing new technology: Exploring pre-service teachers' perceptions and reflections upon the affordances of social media. *Joint Australian Association for Research in Education and Asia-Pacific Educational Research Association Conference,* pp. 1-12. Retrieved from http://www1.aare.edu.au

Reed, P. (2013). Hashtags and retweets: Using Twitter to aid community, communication and casual (informal) learning. *Research in Learning Technology*, *21*, 1-21. http://dx.doi.org/10.3402/rlt.v21i0.19692

Retelny, D., Birnholtz, J., & Hancock, J. (2012). Tweeting for class: Using social media to enable student co-construction of lectures. *ACM 2012 Conference on Computer Supported Cooperative Work Companion*, pp. 203-206. http://dx.doi.org/10.1145/2141512.2141578

Risser, H. S. (2013). Virtual induction: A novice teacher's use of Twitter to form an informal mentoring network. *Teaching and Teacher Education*, *35*, 25-33. http://dx.doi.org/10.1016/j.tate.2013.05.001

Ruokonen, I., Kiilu, K., Muldma, M., Vikat, M., & Ruismaki, H. (2011). "They have always supported my choices." Creative catalysts in university students' learning envrionments. *The 2nd International Conference on Education and Educational Psychology*, *29*, pp. 412-421. http://dx.doi.org/10.1016/j.sbspro.2011.11.257

Saavedra, A. R., & Opfer, V. D. (2012, October). Learning 21st-century skills requires 21st-century teaching. *Phi Delta Kappan*, *94*(2), 8-13. http://dx.doi.org/10.1177/003172171209400203

Sancho, T., & Vries, F. D. (2013). Virtual learning environments, social media and MOOCs: key elements in the conceptualisation of new scenarios in higher education: EADTU conference 2013. *Open Learning*, *28*(3), 166-170. http://dx.doi.org/10.1080/02680513.2014.888000

Schneider, J. (2013). Cyber skepticism. *Phi Delta Kappan*, *95*(4), 80. http://dx.doi.org/10.1177/003172171309500421

Settle, Q., Telg, R., Baker, L. M., Irani, T., Rhoades, E., & Rutherford, T. (2012). Social media in education: The relationship between past use and current perceptions. *Journal of Agricultural Education*, *53*(3), 137-153. http://dx.doi.org/10.5032/jae.2012.03137

Smith, N. V. (2014). Teaching beyond connectivity: A year comparing blended and face-to-face learning in a secondary classroom. *New Zealand Journal of Teachers' Work*, *11*, 93-106.

Stein, L., & Prewett, A. (2009). Media literacy education in the social studies: Teacher perceptions and curricular challenges. *Teacher Education Quarterly*, *36*(1), 131-148.

Swindle, T. M., Ward, W. L., Whiteside-Mansell, L., Bokony, P., & Pettit, D. (2014). Technology use and interest among low-income parents of young children: Differences by age group and ethnicity. *Journal of Nutrition Education and Behavior*, *46*(6), 484-490. http://dx.doi.org/10.1016/j.jneb.2014.06.004

Tagtmeier, C. (2010, September). Facebook vs. Twitter: Battle of the social network stars. *Computers in Libraries*, *30*(7), 6-10. Retrieved from http://www.infotoday.com

Tanner, L. (2009). Teaching social studies to the media generation. *Social Science Research & Practice*, *4*(2), 140-144. Retrieved from http://www.socstrp.org/issues/PDF/4.2.14.pdf

Tess, P. A. (2013). The role of social media in higher education classes (real and virtual) - A literature review. *Computers in Human Behavior*, *29*, A60-A68. http://dx.doi.org/10.1016/j.chb.2012.12.032

The Klout score. (2014). Retrieved from https://klout.com/corp/score

Tiernan, P. (2014). A study of the use of Twitter by students for lecture engagement and discussion. *Education and Information Technologies*, *19*(4), 673-690.

Tyma, A. (2011). Connecting with what is out there!: Using Twitter in the large lecture. *Communication Teacher*, *25*(3), 175-181.

Veletslanos, G. (2012). Higher education scholars' participation and practices on Twitter. *Journal of Computer Assisted Learning, 28,* 336-349. http://dx.doi.org/10.1111/j.1365-2729.2011.00449.x

Walmsley, A. (2014, March). Unplug the kids. *Phi Delta Kappan, 95*(6), 80. http://dx.doi.org/10.1177/003172171409500621

Williamson, R., Jr. (2013). Using Twitter to teach reader-oriented biblical interpretation: "Tweading" the gospel of Mark. *Teaching Theology and Religion, 16*(3), 274-286.

Young, J. (2010). Teaching with Twitter: Not for the faint of heart. *Education Digest: Essential Readings Condensed for Quick Review, 75*(7), 9-12. Retrieved from http://www.eddigest.com/index.php

Zhang, J. (2009). Toward a creative social web for learners and teachers. *Educational Researchers, 38*(4), 274-279. Retrieved from http://www.jstor.org/stable/205325444

APPENDIX A. PRETEST

Twitter Survey - PRE – An analysis of the effect of Twitter on secondary student performance and engagement

Directions – Do not put your name on this survey. Answer all of the questions below.

Sex M F

Grade 11 12

Have you used Twitter before taking this course for any reason? Yes No

Have you used Twitter before in a different class? Yes No

Do you have a smartphone? Yes No

Do you have a computer at home with access to the internet? Yes No

Have you used discussion boards online previously for any reason? Yes No

Have you used discussion boards online previously for a class? Yes No

In the past month, how many days did you check Twitter using a smart phone (if you don't use Twitter, put 0)? _____

In the past month, how many days did you check Twitter using a computer (if you don't use Twitter, put 0)? _____

For the next section, circle the number that best matches your feelings according to the scale below.

1 – Strongly Disagree; 2 – Disagree; 3 – Neutral; 4 – Agree; 5 – Strongly Agree

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Overall, I believe Twitter will be an effective tool for this course

1 2 3 4 5

I believe Twitter will help me to interact with my classmates more easily

1 2 3 4 5

I believe Twitter will help me to express my opinions related to the course

1 2 3 4 5

I believe Twitter will help me to keep track of the course schedule

1 2 3 4 5

I believe online discussions are helpful in learning course material

1 2 3 4 5

I believe that Twitter will help me to learn the course material

1 2 3 4 5

I believe that I will enjoy using Twitter in the class

1 2 3 4 5

I enjoy using technologically based tools in classes

1 2 3 4 5

I believe using technology in class helps me to learn the course material

1 2 3 4 5

My computer based skills in general are strong

1 2 3 4 5

I am comfortable using a smart phone in general

1 2 3 4 5

I am familiar with using social media on the computer

1 2 3 4 5

I am familiar with using social media on smart phones

1 2 3 4 5

For the next section, answer by freely writing your thoughts to each question… use another piece of paper if needed…

In your opinion, what do you think will be some benefits of using Twitter for education? Explain…

In your opinion, what do you think will be some challenges of using Twitter for education? Explain…

In your opinion, will you enjoy using Twitter in the course? Explain…

In your opinion, what are some benefits of using technologically based tools for education in general.

In your opinion, what are some of the challenges of using technologically based tools for education in general.

APPENDIX B. POSTTEST

Twitter Survey - POST – An analysis of the effect of Twitter on secondary student performance and engagement

Directions – Do not put your name on this survey. Answer all of the questions below.

Sex M F

Grade 11 12

Have you used Twitter before taking this course for any reason? Yes No

Have you used Twitter before in a different class? Yes No

Do you have a smartphone? Yes No

Do you have a computer at home with access to the internet? Yes No

Have you used discussion boards online previously for any reason? Yes No

Have you used discussion boards online previously for a class? Yes No

In the past month, how many days did you check Twitter using a smart phone (if you don't use Twitter, put 0)? _____

In the past month, how many days did you check Twitter using a computer (if you don't use Twitter, put 0)? _____

For the next section, circle the number that best matches your feelings according to the scale below.

1 – Strongly Disagree; 2 – Disagree; 3 – Neutral; 4 – Agree; 5 – Strongly Agree

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Overall, I believe Twitter was an effective tool for this course

1 2 3 4 5

I believe Twitter helped me to interact with my classmates more easily

1 2 3 4 5

I believe Twitter helped me to express my opinions related to the course

1 2 3 4 5

I believe Twitter helped me to keep track of the course schedule

1 2 3 4 5

I believe online discussions are helpful in learning course material

1 2 3 4 5

I believe that Twitter helped me to learn the course material

1 2 3 4 5

I enjoyed using Twitter in the class

1 2 3 4 5

I enjoy using technologically based tools in classes

1 2 3 4 5

I believe using technology in class helps me to learn the course material

1 2 3 4 5

My computer based skills in general are strong

1 2 3 4 5

I am comfortable using a smart phone in general

1 2 3 4 5

I am familiar with using social media on the computer

1 2 3 4 5

I am familiar with using social media on smart phones

1 2 3 4 5

For the next section, answer by freely writing your thoughts to each question… use another piece of paper if needed…

In your opinion, what were some benefits of using Twitter for education? Explain…

In your opinion, what were some challenges of using Twitter for education? Explain…

In your opinion, did you enjoy using Twitter in the course? Explain…

In your opinion, what are some benefits of using technologically based tools for education in general.

In your opinion, what are some of the challenges of using technologically based tools for education in general.

APPENDIX C. DISCUSSION RUBRICS

Sociology – Music Videos and Summary Reflections

Teacher Name: **Mr. Slocomb**

Student Name: _____

CATEGORY	Missing/NA – 0	Below Standard - 6	Slightly Below Standard – 8	Fully Meets Standard - 10
Music Videos				
Summary Journaling				
Application of Sociology				
Writing Clarity				
Thoroughness				