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The suitableness of Google Documents as a student collaborative writing tool

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The suitableness of Google Documents as a student collaborative writing tool

by

Todd Vens

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in partial fulfillment of the requirements for the degree of

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ABSTRACT

Collaborative writing appears to be an academic exercise whose relevance will only continue to rise, especially with the ever-increasing arrival of newer technology easily appropriated for educational uses. Often this new technology is commercially produced or open source, free, incredibly intuitive to use, and most important, created for the express purpose of facilitating collaborative writing. It is important to understand if these new technologies, commonly referred to as collaborative writing environments, offer a common-sense, low-to-no-cost means for institutions of higher learning to address the challenge of teaching collaborative writing skills to students. This qualitative research study analyzed one of these new tools, Google Documents, to determine its suitability as a collaborative writing environment for students. Google Documents was the object of inquiry because of its recent adoption campus-wide for all students to use at Iowa State. A dual approach to investigate Google Documents was conducted to determine its suitability as a collaborative writing environment for students. A set of criteria, which I coined The Essential Collaborative Writing Toolkit, for evaluating collaborative writing environments was drawn from the research literature. I was then able to measure Google Documents against these criteria in order to see if it adequately met the specifications needed for a successful collaborative writing environment. Students were also interviewed to discover their experiences using Google Documents. A transcript analysis of these interviews was then made. My findings suggest that Google Documents, with little exception, is an appropriate collaborative writing environment for students. I came to this determination following the synthesis of two things: the results of seeing how well Google Documents met the standards of The Essential Collaborative Writing Toolkit, and students' impressions of Google Documents taken from the transcript analyses.
CHAPTER 1. OVERVIEW

"Collaborative writing reminds students that we are individuals in concert where the music needs all the players for its greatest and resounding sound."

— Alan Altany, *Shibboleths and the techniques of technological idolatries*.

"Writing is one decision after another. And learning to make knowledgeable, discerning, reliable decisions in any activity is something we learn best collaboratively."


"The original thing I wanted to do was make the Web a collaborative medium, a place where we can all meet and read and write."


**Introduction**

Collaborative writing is one of the very few forms of group work that can prove to be as important to students’ work after college as it is to students’ learning in the college classroom. Some have suggested including collaborative writing in the college curriculum is necessary because it is “a highly essential writing and group act” that is already “widely performed in industry, academia, and government,” and its “importance is likely to continue into the foreseeable future, especially as most work in business involves collaborative work” (Paul Lowry, Aaron Curtis, & Michelle Lowry, 2004, p. 67).

Others believe the value of collaborative writing lies more in its ability to improve student academic achievement:
Collaborative writing helps people work with others, develop an ability to both hear and listen, find out what one really thinks and how much one will defend that thinking or be willing to change it. It develops friendships that transcend class periods and proximity of chairs, benefit from other perspectives, worldviews, interpretations. Participants work out ways to solve problems caused by disagreement or lack of responsibility, learn more about who is doing the learning (oneself), write with precision, and realize that both the mentor and those in the group take one's ideas seriously. (Altany, 2000)

It makes little difference whether the inclusion of collaborative writing activities in the curriculum is to improve student academic achievement or to prepare students for professional work outside the classroom. Collaborative writing appears to be an academic exercise whose relevance will only continue to rise, especially with the ever-increasing arrival of newer technology easily appropriated for educational uses. Often this new technology is commercially produced or open source, free, incredibly intuitive to use, and most important, created for the express purpose of facilitating collaborative writing (“Peepel,” n.d.; “ShowDocument,” n.d.; “SynchroEdit,” n.d.; “ThinkFree Online,” n.d.; “TypeWith.me,” n.d.; “Vyew,” n.d.; “Writeboard,” n.d.; “xywrite.it,” n.d.; “Zoho Writer,” n.d.).

It is important to understand if these new technologies, commonly referred to as collaborative writing environments (Bendix & Vitali, 1999; Busschots, Raeside, Keating, & Waddington, 2007; Cerratto Pargman, 2003; K. Cho & M. Cho, 2007; Gijsbert Erkens, Jos Jaspers, Maaike Prangsma, & Gellof Kanselaar, 2005; J.G.M. Jaspers, G. Erkens, & G. Kanselaar, 2001; Jones, 2008), offer a common-sense, low-to-no-cost means for institutions of higher learning to address the challenge of imparting collaborative writing skills to students. Unlike their well-studied counterparts originating out of the ranks of academia -- e.g., Aspects (Cooney, 1998), CollabEd (Granville & Hickey, 2009), Contexts (Delisle & Schwartz, 1987), CoWeb (Rick & Guzdial, 2006), CoWord (Youngblood & Joel West, 2008), GroupWriter (Malcolm & Gaines, 1991), PENCACOLAS (Blasco et al., 1999), PREP editor (Neuwirth,
Kaufer, Chandhok, & Morris, 1990), Quilt (Leland, Fish, & Kraut, 1988), SASSE (Posner & Baecker, 1992), ShrEdit (Mitchell, Posner, & Baecker, 1995), and the VTIE Collaborative Writing Environment (Busschots et al., 2007) -- these new collaborative writing environments have yet to face the scrutiny of similar analysis, especially when they are being used by teams of student collaborators. I believe my research helps to fill this void in the literature.

In this study I analyze one of these new tools, Google Documents, to determine its suitability as a collaborative writing environment for students. Google Documents was the object of inquiry because of its recent adoption campus-wide for all students' use at the investigator's institution.

**Evaluating Google Documents**

Examining the research literature for a set of criteria by which to evaluate Google Documents proved to be interesting and rewarding, but also exhausting because most investigators studied only a single variable, i.e. role control (Prilla & Ritterskamp, 2006) or synchronicity (Youngblood & Joel West, 2008), in the course of their research. Ultimately, an ad hoc set of standards to appraise collaborative writing environments was assembled piecemeal from the existing research literature. These criteria for evaluating collaborative writing environments, also known as *The Essential Collaborative Writing Toolkit*, were distilled to the following categories: fundamentals, role control, version control, synchronicity, awareness, and communication.

The *fundamentals* encompasses a collaborative writing environment's ability to simulate popular commercial word processors (Malcolm & Gaines, 1991); its capacity to run on any web browser, operating system, and hardware platform (P.B. Lowry, Nunamaker, Booker, A. Curtis, & M.R. Lowry, 2004); and its accessibility from anywhere, any time (G. Kanselaar, G. Erkens,
Role control is a collaborative writing environment's means of giving two or more collaborators co-ownership of a document (Prilla & Ritterskamp, 2006), while also protecting their privacy (Malcolm & Gaines, 1991).

Version Control includes maintaining a unique version of the collaborators’ document at all times (Chang et al., 1995), while simultaneously tracking changes to the document (Malcolm & Gaines, 1991) and who made them (P.B. Lowry et al., 2004).

Synchronicity is a collaborative writing environment's capacity for allowing team members to work on a document at the same time with each other (Youngblood & Joel West, 2008).

Awareness is how well a collaborative writing environment shows each writer's respective location in and contribution to the document as they work together in real time (Sundholm, 2006).

Communication comprises the tools (email, commenting, and chat) collaborators use to negotiate, coordinate, and communicate during the composition process (Paul Lowry et al., 2004).

In the next section, I present my research questions, showing how they arose from my concern regarding Google Documents’ suitability as a collaborative writing environment for students.

Research Questions

Collaborative writing has been described as “groups of two or more people working in concert on a common text project in an environment supportive of their text and idea sharing” (Bonk & King, 1998, p. 7). From this statement we may infer two unknowns, the research
questions of this study, regarding these new collaborative writing tools:

1. What are group members' experiences with this new technology?

2. Is the writing environment supportive of collaborators' text and idea sharing?

To answer these research questions, an investigation of Google Documents was conducted dually: a review of the literature was conducted to determine if Google Documents could adequately meet the specifications needed for a successful collaborative writing environment; and a transcript analysis of interviews with students who utilized Google Documents for two collaborative team projects.

**Limitations of the Study**

Because qualitative research studies have a purposive sample, the selection of my research participants was not random. They were intentionally selected from an online course using Google Documents. Although the findings were rich with insight from the student participants, generalizing the study findings to a larger population and wider setting is relatively impossible. The research findings can only reflect the participant's experience of this particular course.
CHAPTER 2. REVIEW OF LITERATURE

Introduction

The purpose of this study was to determine the suitability of Google Documents as a collaborative writing environment for students. Collaborative learning activities, including collaborative writing, are valued by many educators who strongly believe in their instructional value. In this chapter I survey collaborative learning, collaborative writing, and collaborative writing environments.

The basis of collaborative writing's power lies in collaborative learning, therefore I will begin with a definition of collaborative learning, its epistemological foundations and many benefits. This is followed by a discussion of collaborative writing (a unique form of collaborative learning), its relation to solo authorship, benefits to collaborators, and its philosophical underpinnings. I conclude this chapter with an overview of collaborative writing environments, collaborative writing's tools of the trade, built on the foundations of collaborative learning research, ensuring teammates' successful collaboration.

Collaborative Learning

It is widely believed collaborative writing is a form of collaborative work that improves student academic achievement. This feat is accomplished through the processes of collaborative learning. In this section I will define collaborative learning, including its epistemological foundations, then outline its many benefits.

Defining Collaborative Learning

To understand collaborative learning, it is necessary to address a minor controversy among researchers, the collaborative learning versus cooperative learning debate. Within
collaborative learning literature there is much concentration and debate on whether certain group activities are truly “collaborative” or instead “cooperative”. There is much confusion surrounding the terms collaboration and cooperation. I will briefly discuss this parsing of terms in the research literature.

**The Collaborative Learning, Cooperative Learning Debate**

Some authors who see collaborative and cooperative learning as discrete states on opposite ends of a group work continuum, posit the distinction lies primarily in the role the instructor takes during the group activity and how the students accomplish the task. Barkley, Cross, and Major state that cooperative learning principally differs from collaborative learning in that:

the teacher retains the traditional dual role of subject matter expert and authority in the classroom. The teacher designs and assigns group learning tasks, manages time and resources, and monitors students' learning, checking to see that students are on task and that the group process is working well (2004, pp. 5-6).

Whereas in collaborative learning “it is not up to the teacher to monitor group learning, but rather the teacher's responsibility is to become a member, along with students, of a community in search of knowledge” (ibid.).

Other authors, like Ingram and Hathorn, believe collaborative and cooperative learning clearly vary by the amount of independence and interdependence exhibited by students in the group. For these researchers, cooperative learning “is defined as individuals in a group dividing the work so that each solves a portion of the problem” (2009, p. 314). This is contrasted with collaborative learning which is “characterized by members of a group working together to complete all aspects of a project, and all members of the group are jointly accountable for the finished product” (Ingram & Hathorn, 2009, p. 318).

There are also authors who believe the difference between cooperative and collaborative
Learning lies in the type of interaction that occurs in student groups. These researchers emphasize their belief that in collaborative learning “interaction occurs between the collaborative students which enhances knowledge acquisition” (McInerney & Roberts, 2009, p. 320), while in cooperative learning “interaction occurs within the student groups who work or act together as one to achieve a common goal” (McInerney & Roberts, 2009, p. 321).

**Cooperative Learning is Collaborative Learning**

Researchers like Erkens, Andriessen, & Peters (2003, p. 277) dispute these distinctions between cooperative and collaborative learning, believing it is futile to avoid conflation of the two terms:

> Some authors distinguish cooperation and collaboration, the first referring to situations in which there is role and task division, while the second is reserved for partners working together on the task at the same time. We propose not to make this distinction, as it confounds task characteristics with task strategy.

Rather than delineating the terms cooperative and collaborative through a circumscribed set of traits and behaviors, I instead concur with Resta and Laferrière’s assessment that “collaborative learning is a complex concept and not a clearly defined one. There is no universally adopted meaning of the terms ‘collaborative’ and ‘cooperative’ learning or agreement on precisely what their differences or commonalities are” (2007, p. 66). Because my research focus was not to detail the dynamics of the groups’ interaction but to assess the effectiveness of a writing tool to enhance group work, the fine-grained observation required to determine whether students were interacting cooperatively or collaboratively was beyond the scope of this paper. I have decided to take an alternate, more pragmatic approach, joining authors like Collis and Moonen (2009, p. 327) and Barkley, Cross and Major (2004, p. 4), who use the terms collaborative and cooperative interchangeably.
Collaborative Learning’s Epistemological Foundations

Collaborative learning can be thought of as occurring for learners in two distinct, but often overlapping, ways: the interaction resulting from discourse, e.g. threaded discussions; and the interaction resulting from the creation of a product through the interchange with others and/or in the accomplishment of a task set forth by the instructor.

Most authors concur that successful collaborative learning results from learner interaction. This interaction can include a broad range of activities, including the contribution of each team member’s “personal experience, information, perspective, insight, skills and attitudes with the intent of improving the learning accomplishments of others” (Xiaoguang & Zhichang, 2002, p. 200); or it could be team members “discussing and explaining content, solving problems, providing feedback, and ensuring mutual success among all members” (Conrad, 2009, p. 89).

The basis for this belief in learning via collaboration has its foundation in social constructivist theory. I will discuss this particular philosophy of knowledge and how it underlies the fundamental assumptions of collaborative learning in the next section.

Collaborative Learning as Social Interaction

Social constructivism is closely related to constructivist theory. First attributed to Jean Piaget (Palloff & Pratt, 2004), constructivist theory postulates that the learner generates knowledge through “an active process of constructing rather than acquiring knowledge” (Prilla & Ritterskamp, 2006, p. 259) as they make sense of their experiences (Han & Hill, 2006, p. 30). Because it is the individual mind that “filters input from the world” in order to interpret it, each of us perceives “external reality somewhat differently, based upon our unique set of experiences with the world and our beliefs about them” (Jonassen, Davidson, Collins, Campbell, & Haag,
Constructivists believe the key to successful instruction then is a pedagogy that includes: placing learners in “direct interaction with information” rather than transmitting the information to them, because “learning is a proactive and goal-oriented process” (Alavi & Dufner, 2005, p. 192); creating learning activities where students “generate something they use to test their ideas with each other, becoming active investigators, seekers and problem solvers” (Collis & Moonen, 2009, p. 328); engaging learners “so that the knowledge they construct is not inert, but rather usable in new and different situations” (Jonassen et al., 1995, p. 11) and “embedding learning in real-world situations in which learners function as a part of a community of practitioners helping to solve real-world problems” (Jonassen et al., 1995, p. 12).

Social constructivists take constructivism a step further by assuming that “learning emerges as an individual interacts with other individuals” (Alavi & Dufner, 2005, p. 192). Social constructivism can be seen as “complementary (rather than contradictory) to the constructivist perspective in that it postulates that individual cognition and thinking are socially rooted and are initially shared between people, although they are gradually internalized by individuals” (Alavi & Dufner, 2005, p. 192).

Much of social constructivist theory can be traced back to the work of Lev Vygotsky (1978) and his seminal concepts of the zone of proximal development, scaffolding and intersubjectivity. Vygotsky defines the zone of proximal development as “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 86), or to put it another way, it is the difference between a learner trying to understand a new concept alone as opposed to learning it with the help of a teacher or fellow students. Scaffolding involves giving learners “a great deal of
support initially and then encouraged to become more independent and responsible for their learning as soon as possible” (Stacey, 2005, p. 154). *Intersubjectivity* has been described as the “understanding achieved when people work together to co-construct resolution of a problem” (Conrad, 2009, p. 89), or the creation of “new understandings which are more than the mere combination of two or more points of view” (Ligorio, Talamo, & Pontecorvo, 2005, p. 360).

Because the student’s “understanding of the world is mediated by and built up through interaction with others, and meanings are negotiated and established through interaction in a wide range of social contexts” (Littleton & Hakkinen, 1999, p. 24), this ultimately results in the student internalizing this discourse as the basis for reflection and logical reasoning, or as Bruffee puts it:

> Reflective thought is social conversation internalized. First we experience and learn the craft of interdependence-in the arena of direct social exchange with other people. Only then, Vygotsky demonstrates, do we learn to displace that skill and partnership by dramatizing and playing out silently within ourselves the role of every participant in the conversation (1998, p. 134).

Cooney believes it is through collaborative learning that students recognize knowledge “is continually made and remade, shaped, and formed” because they challenge one another with questions, use the evidence and information available to them, develop relationships among issues, and assume knowledge is something they can help create rather than something to be received whole from someone else (Cooney, 1998, p. 264). Therefore we can conclude that collaborative learning by its very nature “encompasses the social constructivist perspective of valuing personal autonomy in learning as well as relatedness, through the use of methods of collaboration and interdependence that emphasize personal responsibility and individual accountability” (Stacey, 2005, p. 145).

In order to craft social constructivist pedagogy, it is necessary to foster an environment where learners can “build on their knowledge by interacting with each other, their educators, and
their learning materials” (Minocha & Thomas, 2007, p. 190). This involves: creating activities where students “interact with each other while performing a task” (Alavi & Dufner, 2005, p. 192); providing students “opportunities to actively collect and organize information, and to collaboratively transform that information into cognitive structures” (James A. West & Margaret L. West, 2008, p. 59); organizing “small groups of learners to work together to accomplish some shared goals” (Fung, 2004, p. 136). Minocha and Thomas have put it even more specifically:

There are three main characteristics built into social constructivist scenarios: they use complex, realistic problems; they use group collaboration, interaction and cooperation; and learners are responsible and set goals, while teachers provide guidance (2007, p. 190).

In the next section I will move past epistemology, beyond collaborative learning's foundations in social constructivist theory to consider something more pragmatic: a discussion of collaborative learning's benefits.

**Benefits of Collaborative Learning**

Collaborative learning activities, especially when supported by collaborative technology, are credited with numerous benefits. These benefits can roughly be classified into two broad categories: social benefits and academic benefits.

**Social Benefits**

Collaborative learning has been shown to meet many of the emotional needs required by students. Through collaborative learning activities students have reported feelings of greater inclusion and reduced isolation (Downing & Holtz, 2008; Haythornthwaite, 2006; Ingleton, Doube, & Rogers, 2000; McInerney & Roberts, 2009; Stacey, 2005). The literature also includes frequent descriptions of increased student engagement and motivation (to study, complete assignments, etc.) resulting from collaborative learning activities (Busschots, Raeside,

Another very important social benefit associated with students working collaboratively in the virtual or physical classroom is the certainty it can create or improve teamwork skills. This is important because employers desire college graduates with developed teamwork skills (Abrami & Bures, 1996; Burgos, Hummel, Tattersall, Brouns, & Koper, 2008; Cagiltay, Bichelmeyer, Evans, Paulus, & Soon An, 2009; Constantino-González & Suthers, 2001; Duarte & Snyder, 2006; Ingleton et al., 2000; Klemm, 2005; Minocha & Thomas, 2007; Palloff & Pratt, 2004; Payne et al., 2006; Richardson, 2006; Tapscott & Williams, 2006; Thatcher, 2005). Crook puts it very succinctly when he states:

There is now a popular belief that the modern workplace demands from individuals a willingness and ability to coordinate mental effort with others. In particular, working in the new digital economy requires a style of thinking that is comfortable with the social structures of networking and teamworking (2009, p. 3).

It is believed collaborative learning builds teamwork skills in a variety of ways. Ingleton et al. make the general claim that “collaborative learning activities prepare students in any discipline for the world of work” by developing “generic skills needed to satisfy employer
expectations” (2000, p. 5). There is also the pragmatic (and Pragmatist) notion that collaborative learning “affords students a firsthand experience to gain teamwork skills” (Payne, Monk-Turner, D. Smith, & Sumter, 2006, p. 441) and prepares them “to solve problems in a real-world environment by showing them the benefits of group work and initiating them into the real world dynamics of being a team player” (McInerney & Roberts, 2009, p. 324).

Collaborative learning can also help students build valued teamwork skills in less direct ways, including demonstrating how to: manage conflict, be non-judgmental, be sensitive to cultural differences, be adaptable, negotiate differences, build trust, learn from one another, and share ideas as well as listen to the ideas of others (Baskin, 2001; Bruffee, 1998; Grodecka, Wild, & Kieslinger, 2008; Haythornthwaite, 2006; Hiltz et al., 2005; Ingleton et al., 2000; McInerney & Roberts, 2009; Payne et al., 2006; Peres & Pimenta, 2007; Roberts, 2005).

**Academic Benefits**

While discussing the academic benefits of collaborative learning, Palloff and Pratt assert it is through collaborative engagement that “the likelihood of successful achievement of learning objectives and achieving course competencies increases” (2004, p. 8). McInerney and Roberts reiterate this point, stating that “students involved in the cooperative learning process exhibit a higher learning rate, excel academically, and achieve more in the post graduate workplace” (2009, p. 324).

Collaborative learning improves student academic achievement through the enhancement of students’ metacognitive awareness and building their critical thinking and problem-solving skills (Busschots et al., 2007; Cockrell, Caplow, & Donaldson, 2000; Conrad, 2009; Fung, 2004; Gokhale, 1995; Goodsell et al., 1992; Ingleton et al., 2000; D. W. Johnson & R. T. Johnson, 2004; Payne et al., 2006; Resta & Laferrière, 2007; Roberts, 2005; P. Smith; V. Taylor, 2005). It
has also been demonstrated that collaborative groups, through their active construction of knowledge, are able to create a deeper understanding of course subject matter and mastery of content (Downing & Holtz, 2008; Gokhale, 1995; Goodsell et al., 1992; D. W. Johnson & R. T. Johnson, 2004; Palloff & Pratt, 2004; Payne et al., 2006; Resta & Laferrière, 2007; P. Smith). Busschots et al. (2007) describe this concomitant “construction of knowledge and the development of understanding” being a result of students receiving “instant feedback from others” which encourages them “to explore their current knowledge and exposes flaws or limitations and to review their ideas” (p. 393).

Collaboration promotes students’ time/task management skills, and their ability to persist on tasks and complete assignments (Ingleton et al., 2000; D. W. Johnson & R. T. Johnson, 2004; Roberts, 2005). Collaborative teams also show demonstrable improvements in the retention of information, including the long-term retention of what is learned, and the ability to transfer this knowledge from one situation to another (Gokhale, 1995; Ingleton et al., 2000; D. W. Johnson & R. T. Johnson, 2004).

Collaborative Writing

Although collaborative writing can be understood as one type of collaborative learning among many, it is really much more than this. In the next section, Writing Alone, I will highlight the unique qualities of composing by oneself. Following this is the section Writing Together, emphasizing the distinctive characteristics of collaborative writing which build upon solo writing.

Writing Alone

When an instructor assigns an individual written assignment to a student, the student
engages in what Emig describes as “a unique mode of learning - not merely valuable, not merely special, but unique…because writing as process, and product, possesses a cluster of attributes that correspond uniquely to certain powerful learning strategies” (1977, p. 122). Emig explains these attributes and strategies further:

Writing connects the three major tenses (past, present, and future) of our experience to make meaning. And the two major modes by which these three aspects are united are the processes of analysis and synthesis: analysis, the breaking of entities into their constituent parts; and synthesis, combining or fusing these, often into fresh arrangements or amalgams. Finally, writing is epigenetic, with the complex evolutionary development of thought steadily and graphically visible and available throughout as a record of the journey, from jottings and notes to full discursive formulations. (1977, p. 127)

In addition to Emig, there are many others who have also commented on the singular power of writing. Wells, for example, believes “it is in writing that new ideas are brought into the ongoing dialogue, and it is the resulting written texts that preserve those ideas and make them available for critique and further development” (1999, p. 287).

Bruffee, on the other hand, sees learning having an epistemological foundation in writing: “a private, solitary, ‘expressive’ act in which language is a conduit from solitary mind to solitary mind” (Bruffee, 1998, pp. 54-55). Expanding on his Vygotskian definition of thought, referenced earlier in this paper and summarized as “thought is internalized public and social talk” (p. 641), Bruffee (1984) adds that “writing of all kinds is internalized social talk made public and social again” (p. 641).

Another learning theory rivaling constructivism in its importance to writing is constructionism. In *Situating Constructionism*, Seymour Papert (1991), constructionism’s originator, says that “constructionism boils down to demanding that everything be understood by being constructed” (p. 2). Papert, a disciple of Piaget, adheres to the precept that “constructivism is the idea that knowledge is something you build in your head”, but he believes the best way to
accomplish this is through constructionism because it makes you, the learner, “build something tangible - something outside your head - that is also personally meaningful” (Papert, n.d.). This “something outside your head” is the key to learning, because “new ideas are most likely to be created when learners are actively engaged in building some type of external artifact that they can reflect upon and share with others” (Han & Bhattacharya, 2001).

But there is one thing rivaling “the production of public artifacts” (Forte & Bruckman, 2007, p. 31) in its importance to constructionism and that is how these objects are made: with computers. Papert (1991) explains that in constructionism “computers figure so prominetly…because they provide an especially wide range of excellent contexts for constructionist learning” (p. 8). Or to put it another way:

Computers and computing offer profound opportunities to learn new things, old things in new ways and construct knowledge in ways that would be inaccessible without access to technology. Constructionism particularly applies to learning with digital technology. (Stager, 2005, pp. 4-5)

In his seminal work, Mindstorms, Papert (1993) elucidates constructionism’s central maxim of ‘learning through creating’ with the example of a student using word processing software to write a document:

The first draft is composed at the keyboard. Corrections are made easily. The current copy is always neat and tidy. I have seen a child move from total rejection of writing to an intense involvement (accompanied by rapid improvement of quality) within a few weeks of beginning to write with a computer. I believe that the computer as writing instrument offers children an opportunity to become more like adults, indeed like advanced professionals, in their relationship to their intellectual products and to themselves. (pp. 30-31)

This example also perfectly illustrates the significant position computers hold in Papert's constructionism.

Having limned on conventional, solo writing's important contribution to learning through the power of constructionism, the stage has been set to extend this to the realm of collaborative
writing, covered in the next section.

**Writing Together**

Although it has been described most simply as “the creation of documents with the participation of several individuals” (Mitchell et al., 1995, p. 290), collaborative writing is in reality a very complex process where the basic elements of individual writing – “planning, translating, and revising” (Gijsbert Erkens et al., 2003, p. 122) – are complicated and intensified by the addition of more authors (Paul Lowry et al., 2004, p. 72). The causes of this greater complexity result from the increased need to coordinate between multiple viewpoints and work efforts, and the need to establish consensus; group members’ waning dedication to writing tasks that take place over extended periods of time; and the distraction of group members personal commitments (Paul Lowry et al., 2004, p. 70).

Notwithstanding its inherent complexity, collaborative writing’s proponents believe this is easily outweighed by its many benefits. Often these benefits add to and build on those of collaborative learning. These benefits, like those of collaborative learning, can in general be divided into the social or academic.

**Social Benefits**

Because collaborative writing is understood as a subset of collaborative learning, some of the social benefits of collaborative writing correspond directly to those of collaborative learning. The most obvious social benefits paralleling collaborative writing and collaborative learning include: the building of interpersonal relationships, friendships, camaraderie among group members; developing a greater capacity to accept others’ perspectives; and acquiring the skills needed to successfully work (write) with others in preparation for the global work environment.
A social benefit specific to collaborative writing can be seen in the review-revision process. Peres and Pimenta (2007) explain that when students write collaboratively, they are more likely to accept and make revisions suggested by team members because “people are uncertain of their points of view and try to form a new solution, qualitatively better through the understanding of the perspectives and the reasoning of other people” (p. 60). But at the same time, through this collaborative interaction, a student also discovers “what one really thinks and how much one will defend that thinking or be willing to change it” (Altany, 2000). This insight occurs because collaborative writing encourages the student to “explore their current knowledge, expose flaws or limitations, and review their ideas” (Busschots et al., 2007, p. 393), as well as “test their hypotheses, justify their propositions, and make their goals explicit” (Gijsbert Erkens et al., 2003, p. 122). Ultimately, this ability to simultaneously adapt/defend their ideas, while also making suggestions to others in the group, is only possible because of “the feeling of joint responsibility for the text which belongs to everyone” (Peres & Pimenta, 2007, p. 61).

**Academic Benefits**

Like the social benefits of collaborative writing, the academic benefits of collaborative writing often overlap those of collaborative learning. These include students: creating a deeper understanding of course material; improving their motivation to learn; and increasing metacognitive and critical thinking skills (Altany, 2000; Busschots et al., 2007; Gijsbert Erkens et al., 2003; Peres & Pimenta, 2007).

A benefit especially unique to collaborative writing is that it often results in “a better written product” (G. Cross, 1993, p. 141). This “higher document quality” (Paul Lowry et al.,
2004, p. 67) has many attributions, including students “sharing individual perspectives” (G. Cross, 1993, p. 141) and receiving “immediate feedback from each other on their writing” (Gijsbert Erkens et al., 2003, p. 122). This results in improvements in the quality of document revisions (Zammuner, 1995), reflecting changes in the review-revision process discussed above, and produces “more understandable documents” (Paul Lowry et al., 2004, p. 67).

Another singular characteristic of collaborative writing is the transfer of improved writing skills to the individual student by helping them “to understand the dialogic nature of all composing such that most good solo writing represents a single writer having some internal dialogue with herself-having more than one point of view and using more than one voice” (Fontaine & Hunter, 2005, p. xxv), or put another way, “one is reminded that no one is really a Cartesian bubble” (Altany, 2000).

**Collaborative Constructionism**

Alan Shaw (1995), a thesis advisee of Seymour Papert, envisioned “an expanded view of the constructionistic model” (p. 12), calling it social constructionism. This is not be confused with Berger and Luckmann’s social constructionism, a sociological theory of knowledge outlined in their influential book The Social Construction of Reality (Berger & Luckmann, 1967). In Shaw’s (1995) social constructionism, “a group of subjects serve as active agents in the construction of outcomes and artifacts” (p. 40), and these outcomes and artifacts can include “social relationships; social events; shared physical artifacts; shared social goals and projects; and shared cultural norms and traditions” (p. 44).

Since Shaw, others have also written about this expanded view of constructionism, i.e. social constructionism, and its relation to learning. Forte and Bruckman made social constructionism the cornerstone of a major classroom activity requiring their students to
collaboratively construct a wiki (2007). For Dougiamas and Taylor, social constructionism was the foundation for faculty collaborating to build an educational website (2003). Sade used social constructionism as the basis for his student co-authored blogs (2005).

Other researchers have adopted a variation on the term social constructionism, while maintaining the same meaning, calling it collaborative constructionism. Prasolova-Førland and Divitini had their students collaboratively construct a set of frequently asked questions (FAQs) using a wiki-like environment (2005). Davies and Carbonaro (2000) created a “constructionist collaborative learning environment” (p. 244) for their student teachers to use so they could have the same experience “that they are encouraged to implement with children in their future teaching careers” (p. 262). Patten et al. (2006) created a collaborative constructionist mobile web application “to support learners in constructing their own understanding of the solutions to sorting problems and problems of categorization” (p. 305). Berland and Wilenksy (2004) created a “group collaborative programming” (p. 2) constructionist environment, “in which middle school students can learn complex systems theory, computer science, and programming in a motivating collaborative space” (p. 6).

Papert described student computer-assisted writing as a textbook example of constructionism (1993). Shaw extended constructionism's space of creation from the individual to the group, designating a collaborative form of constructionism. Therefore, the foundational educational theory for students writing collaboratively, especially when facilitated by a computer technology like Google Documents, is collaborative constructionism.

**Collaborative Writing Environments**

The number of collaborative writing environments keeps growing, especially in the commercial and open-source, non-academic realm. These collaborative writing environments fall
into one of three broad categories:

1. Software applications that must be installed on each collaborator’s computer:

2. Plug-ins for Microsoft Word, extending its functionality to include collaboration on documents, thus transforming it into a collaborative writing environments:


The lion’s share of these collaborative writing environments fall into the third category, browser-based and online, including the one being studied in this paper: Google Documents. The features for each of these collaborative writing environments varies widely, but researchers concur on which ones are absolutely essential for successful collaborative writing.

**The Essential Collaborative Writing Toolkit**

At its most basic, collaborative writing has been described as “any writing done in collaboration with one or more persons” (Ede & Lunsford, 1990, p. 14), or “the creation of
documents with the participation of several individuals” (Mitchell et al., 1995, p. 290). Huguley and Rice (1994) offer an even more generic, if not obscure, definition, saying that it “is any writing performed collectively by more than one person that is used to produce a single text” (P. 164). Although these writers attempt to distill collaborative writing down to its most rudimentary traits, they nevertheless fail to elaborate on what makes for successful collaborative writing.

Many authors have expanded on these very simple definitions, believing successful collaborative writing requires something more. Sharples (1999) emphasizes the need to raise the expectations of each writer’s contribution, describing collaborative writing as “one or more collaborators making an explicit identifiable contribution, by planning, drafting or revising the text” (p. 170).

Alternatively, Bonk and King (1998) believe the writers’ success is mostly dependant on their milieu, stating that fruitful collaborative writing will take place “in an environment supportive of their text and idea sharing” (p. 7). It is this collaborative writing environment I will focus on in the rest of this section.

**The Fundamentals**

As a point of reference for what constitutes a successful collaborative writing environment, we could simply say it “is software that allows collaborative writing groups to produce a shared document and helps collaborative writing groups perform the major collaborative writing activities” (Paul Lowry et al., 2004, p. 75). But that innocuous, almost facile, description does not offer adequate guidance to the educator or researcher. Instead we must begin with a baseline of features to serve as the foundation of a successful collaborative writing environment.

First, it is important the writing environment satisfactorily simulate the most common
word processing applications:

The majority of potential users of a group-writing system have a non-technical background and are already familiar with commercial word processors. An acceptable group-writing system has to be very simple and natural to use, and expectations created by single-user systems such as Microsoft Word need to be supported. (Malcolm & Gaines, 1991, p. 149)

Next, it is imperative the writing environment be technically agnostic, able to “run through virtually any web browser, operating system, and/or hardware platform without requiring that end-users be aware of its technical details” (P.B. Lowry et al., 2004, p. 172). Last, the writing environment must be free of geographic and temporal constraints, “accessible from any place at any time” (Kanselaar et al., 2002, p. 25).

With these baseline fundamentals in place, we can begin to discuss the other pieces of the essential writing toolkit.

**Role Control**

For the collaborative writing environment, role control involves having a mechanism in place that allows “for the support of multiple owners for documents” (Prilla & Ritterskamp, 2006, p. 262). When two or more collaborators share ownership of a document, there must also be a way to control the writers’ permissions to access, view or edit the document (Chang et al., 1995, p. 222; Klemm, 2005, p. 196; P.B. Lowry, Nunamaker, Booker, A. Curtis, & M.R. Lowry, 2004, p. 173; Posner & Baecker, 1992, p. 135). Managing collaborators’ permissions must also be flexible enough “to allow for shifting roles at different stages of the writing process” (Mitchell et al., 1995, p. 294).

Equally important as controlling collaborators’ permissions, especially in the arena of education, is protecting collaborators’ privacy. Being able to keep unauthorized users from accessing collaborators’ documents is key, because of possible legal consequences (Malcolm &
Version Control

Central to version control is the ability to reliably maintain a unique version of the collaborators’ document at all times (Chang et al., 1995; Malcolm & Gaines, 1991). This unique version of the document “serves as a team memory and knowledge center, reduces duplication of effort, and helps maintain quality of artifacts produced by students” (Yilmaz, 2008, p. 161).

Beyond maintaining the fidelity of the collaborators’ working document, version control must also “trace the evolution of a document and be able to revert to a previous version if subsequent changes are deemed inadequate” (Malcolm & Gaines, 1991, p. 148). This tracking of the document’s development must also record who has made which changes (P.B. Lowry et al., 2004; Posner & Baecker, 1992) and highlight differences between the text of various versions of the document (Malcolm & Gaines, 1991).

Synchroneity

While it is expected collaborators be able to access and edit a document anytime, anywhere, it is also essential they be able to work on the document at the same time with each other (Blasco et al., 1999; Chang et al., 1995; P.B. Lowry et al., 2004; Posner & Baecker, 1992).

According to Youngblood and West (2008), being able to work synchronously is important for collaborators because there are times when collaborating in real time, in a “tightly coupled” manner may be more productive. For example, it can shorten the time from draft to final approval status if team members can make revisions to the document simultaneously, reviewing and revising each others’ work “on the fly” rather than individually marking up a document and sending it to the next reviewer. (p. 534)
**Awareness**

In the collaborative writing environment, awareness “is simply the knowledge that there are others involved in the project, and who they are” (Yilmaz, 2008, p. 162). It is this awareness that “provides a context for an individual’s activities in a collaborative setting” (P.B. Lowry et al., 2004, p. 174). Awareness can be demonstrated as plainly as displaying a list of names of writers synchronously working on a document (P.B. Lowry et al., 2004, p. 181). But because collaborative writing is normally a very complex activity, to avoid confusion there needs to be a way to more clearly demonstrate collaborators’ respective locations in and contributions to the document (Sundholm, 2006).

Awareness is closely tied to synchronous writing because “collaborative work in distributed settings requires individuals to remain conscious of each other’s contributions and activities” (Korpilahti & Koskinen, 2006, p. 198). This ability “to see what others are doing instantly” (Cerratto, 2002, p. 151), also known as WYSIWIS (What You See Is What I See) in user interface design (Cerratto, 2002; Chang et al., 1995; Reinhard, Schweitzer, Völksen, & Weber, 1994; Youngblood & Joel West, 2008), can be manifested in different ways. One method is to use contrasting colors to distinguish writers’ contributions (Posner & Baecker, 1992; Reinhard et al., 1994). Another method is to use differently shaped cursors to identify group members (Blasco et al., 1999; Reinhard et al., 1994).

**Communication**

Almost every feature of the successful collaborative writing toolkit has been covered: *The Fundamentals, Role Control, Version Control, Synchroneity, and Awareness*. The final feature to investigate, *Communication*, is considered by many researchers as the toolkit’s most essential (Blasco et al., 1999; Bruffee, 1998; Haythornthwaite, 2006; Jonassen et al., 1995; Korpilahti &
Communication in the collaborative writing environment is important for several reasons. One reason is collaborative writing’s inherent complexity, as made evident by Sharples (1999) in the following passage:

Writers need to make their intentions explicit and to agree on the scope of the text, they need to communicate ideas and changes of plan that affect the other contributors, they need to agree on responsibilities and divide up the work, they need to organise the text from multiple sources and to reconcile the different voices and approaches to writing. Lastly, whenever people work together there are conventions to be followed, statuses to be respected, conflicts to be resolved and partnerships to be forged. (p. 170)

The logical conclusion then is that incorporating the necessary communication tools into a collaborative writing environment inevitably alleviates this complexity.

Fontaine and Hunter (2005) offer a similar but potentially more compelling reason for the significance of communication in the collaborative writing environment:

Collaborative writing begins with conversation that continues throughout the writing process, changing purpose and format, but always needing to happen. In collaborative writing, conversation has a particularly fertile and generative power because it establishes the arena of negotiation and creation for the writers. In fact, it is only through conversation that writers working together can identify their shared concerns and shape their ideas. (p. 44)

Fontaine and Hunter feel that communication tools in the collaborative writing environment transcend their utility of lessening the inherent stress of collaborative writing’s intricate machinations. They believe these tools provide the discursive means for fostering a team’s meaning-making process.

Ultimately the collaborative writing environment should be able to promote “the social aspects of teamwork” (Reinhard et al., 1994, p. 29), including giving team members the ability to
negotiate, coordinate, and communicate during the composition process (Paul Lowry, Aaron Curtis, & Michelle Lowry, 2004). For the rest of this section the most common tools used in the collaborative writing environment that support team negotiation, coordination, and communication — email, commenting, and chat — will be discussed.

**Email**

Email is one of the oldest and most ubiquitous asynchronous communication tools. To support negotiation, coordination, and connectedness amongst team members, mechanisms should be in place that tie email directly into the collaborative writing environment (P.B. Lowry et al., 2004; Malcolm & Gaines, 1991; Posner & Baecker, 1992; Reinhard et al., 1994; Yilmaz, 2008).

Beyond its conventional uses to facilitate negotiation, coordination, and connectedness, email is also often utilized in the collaborative writing environment for notification purposes (Leland, Fish, & Kraut, 1988; Yilmaz, 2008). Typically this involves emailing members of the team whenever a change has been made to the document, thus keeping everyone mindful of its evolution (Cerratto, 2002).

**Commenting**

Giving teammates the power to comment, or annotate, the shared document has been recognized as a crucial element of the successful collaborative writing environment (Cerratto, 2002; Chang et al., 1995; Klemm, 2005; Leland et al., 1988; P.B. Lowry et al., 2004; Malcolm & Gaines, 1991; Neuwirth et al., 1990; Posner & Baecker, 1992). According to Cerratto Pargman (2003), a commenting tool creates an asynchronous, contextual dialogue that “is the basis for discussions of plans, coordination, negotiation, and revision focused on that particular section”
Chat

Chat, or instant messaging, tools are described as “technologies that create the possibility of real-time text-based communication between two or more participants over the internet” (“Instant Messenging - Network Dictionary Wiki,” n.d.). Why are these tools acknowledged by so many researchers to be essential to the collaborative writing environment (Gijsbert Erkens, Andriessen, & Peters, 2003; Kanselaar, G. Erkens, Prangsma, & Jaspers, 2002; Leland et al., 1988; Posner & Baecker, 1992; Yilmaz, 2008)?

Holmes and Gardner (2006) express it best when they say instant messaging tools are often needed in the collaborative writing environment because “synchronous interaction provides immediate feedback, so can help with negotiations. Social processes are also important for successful collaboration and a synchronous session can provide greater social presence than the asynchronous environment” (p. 24). Coincidentally, there are two studies where researchers express the fact that research subjects desired and found ways to communicate synchronously while writing together, usually through separate chat tools not integrated into the collaborative writing environment (Collier, 2006, pp. 95-96; Ruth & Houghton, 2009, p. 143).

Summary

In this chapter I surveyed collaborative learning, collaborative writing, and collaborative writing environments. I began with an overview of collaborative learning, the foundation of collaborative writing's strength. This was followed by an appraisal of collaborative writing and its very important relation to collaborative learning. I concluded this chapter with an assessment of collaborative writing environments.
This review of the pertinent research revealed a crucial gap in the literature as it pertains to collaborative writing environments. Whereas collaborative writing environments developed expressly for academic settings were very well researched, the same could not be said for new, commercially produced or open source, collaborative writing environments. My research helps to fill this gap in the research literature through the analysis of one of these new collaborative writing environments, Google Documents.
CHAPTER 3. METHODOLOGY

Introduction

The purpose of the research reported on here was to explore the usefulness of Google Documents as a collaborative writing tool for students. The purpose of my investigation followed a two-pronged approach: (1) determine whether Google Documents adequately meets the specifications necessary for a successful collaborative writing environment through a review of the literature and, the focus of this chapter, (2) analyze interview transcripts of students who utilized Google Documents for two collaborative team projects to determine their perception of its usefulness as a collaborative writing tool.

This chapter begins with the research design for the study. Next the methods employed for data collection are examined. Finally, there is an explication of the data analysis used to examine the transcripts.

Research Design

I used a basic interpretive qualitative research approach in this study. According to Merriam (2002), in a basic interpretive qualitative study

the researcher is interested in understanding how participants make meaning of a situation or phenomenon, this meaning is mediated through the researcher as instrument, the strategy is inductive, and the outcome is descriptive. In conducting a basic qualitative study, you seek to discover and understand a phenomenon, a process, the perspectives and worldviews of the people involved, or a combination of these. (p. 6)

As a direct result of basic interpretive qualitative research's focus on understanding the subjective experience of individuals (Cohen, Manion, & Morrison, 2000, p. 38), I believe it provided me a richness of data not possible through strictly quantitative methods. It was through my access to the lived experiences of real people in real settings that I was able to explore how
they made sense of their everyday lives (Hatch, 2002). Whereas quantitative research emphasizes "the measurement and analysis of causal relationships between variables, not processes" (Denzin & Lincoln, 1998, p. 8), it is these very processes qualitative research is most interested in.

Even though Creswell states, "there is no agreed upon structure for how to design a qualitative study" (Creswell, 2006, p. 41), nonetheless others have tried to lay down defining characteristics of qualitative research design. For example, Maykut, Morehouse, & Morehouse (1994) identified these basic features of qualitative research design:

- **Qualitative research studies have an exploratory and descriptive focus**
  
  My research was designed in the spirit of discovering what could be learned from my participants' experiences having used Google Documents.

- **Qualitative research studies have an emergent design**
  
  My research was emergent, evolving over time. What began as a straightforward rendering of my participants' experiences using Google Documents, metamorphosed into interpreting their impressions through the lens of the research literature's emphasis on the tools deemed fundamental to collaborative writing environments.

- **Qualitative research studies have a purposive sample**
  
  A purposive sample is "a general term for judgmental sampling in which the researcher purposely selects certain groups or individuals for their relevance to the issue being studied" (Gray, Williamson, Karp, & Dalphin, 2007, p. 105). In the case of my research, participants were intentionally selected from an online course using Google Documents.
• **Data is collected in the natural setting**

Because qualitative research is interested in understanding people’s experience in context, my interviews were conducted via telephone at times convenient for participants. This method of data collection was analogous to how students worked in the online class, free of temporal or geographic constraints.

• **Qualitative research studies emphasize ‘human-as-instrument’**

While researchers are certainly pivotal in more traditional research approaches, as a qualitative researcher I had the added responsibility of being both the collector of relevant data — data whose relevance changed as the study proceeded — and the culler of meaning from that data.

• **Qualitative methods of data collection**

The data of qualitative inquiry is most often people’s words and actions, and thus requires methods that allow the researcher to capture language and behavior. To gather my participant data, I used one of the most common and useful ways of gathering this form of data, the semi-structured interview.

• **Data analysis is inductive, early and ongoing**

In qualitative research, analysis begins as soon as a subset of data is accrued. This early analysis allows the most important aspects of the phenomenon under study to begin to emerge. Therefore, what is important is not predetermined by the researcher, instead it is the participant data directing and revealing what is meaningful. In the case of my data collection and analysis, I had to learn to become more flexible in adhering to the interview guide and adjust the guide accordingly.
• *Results are presented within a rich narrative*

Qualitative research should be reported via rich description in order to provide readers with enough information to determine whether the findings of the study possibly apply to other people or settings. I attempted to follow this general guideline for presenting my data within a rich narrative.

**Researcher as Instrument of Inquiry**

In qualitative research, the researcher is the primary research instrument. Because of this, the researcher should acknowledge his or her experience with or relationship to the object of the research. In what follows is the researcher describing himself as the primary instrument of inquiry.

For the last 13 years I have been involved professionally in online learning or training for both the private and public sectors. I am currently a manager of online learning for the College of Agriculture and Life Sciences.

Since working in higher education, my interests have tended toward instructional technology having a low level of entry for users. This means I seek out inexpensive and easy to use tools for instructors and their students.

When I initially found out my employer was adopting the Education Edition of Google Apps for its students, I recognized this as a tremendous opportunity for new collaborative activities, especially for online students. Among the suite of tools included with Google Apps, Google Documents was of particular interest to me. It promised to give instructors the best, new means to provide their students with creative, collaborative activities.
Methods

Research Participants

Research participants for this study consisted of students enrolled in an entirely online course, AgEds 520: Instructional Methods for Adult and Higher Education in Agriculture and Natural Resources, held during the fall semester of 2008 at a large, Midwestern, land-grant university. Although the course was online, students both on- and off-campus could enroll in the course. Almost all of the 32 students were in the Master of Science in Agricultural Education program and AgEds 520 was a required course for them.

Arrangements had been made with the instructor to have two of the course’s assignments be collaboratively written by student teams. Students were divided into teams of three for the collaborative writing assignments. Three is identified as an optimal group size for team projects like collaborative writing because it increases group coordination and participation, while at the same time allowing for greater idea flow and development (Du, Durrington, & Mathews, 2007).

Because there were 32 students, this resulted in 10 groups of three and one group of two. Two students dropped the class. One student dropped the course before the first collaborative writing assignment was due, leaving 31 students for the first collaborative writing assignment. The other student dropped the course after the first collaborative writing assignment, but before the second collaborative writing assignment was due, leaving 30 students for the second collaborative writing assignment. Consequently, for the first collaborative writing assignment there were nine teams of three and two teams of two; and for the second collaborative writing assignment there were eight teams of three and three teams of two.

Altogether, eight of the 11 teams, making up 23 of 31 students, used Google Documents for their first collaborative writing assignment. For the second writing assignment, seven of the
eleven teams, making up 19 of the remaining 30 students, used Google Documents.

Coordination of the two collaborative writing assignments involved creating a Google Document for each team, for each assignment. Since there were eleven teams, this meant creating 22 individual Google Documents in total.

Students were first introduced to the upcoming collaborative activities in the syllabus: "Most papers are completed individually but we will have some collaborative assignments."

During the second week of classes I sent an email to the students (Appendix A) introducing myself and orienting them to the upcoming collaborative projects. This was followed two days later by an email (Appendix B) with a link to a Google Documents tutorial (Appendix C) I had created. This email also had a note explaining that my next communication with them would include the names of their team members and a link to their Google Document for their first collaborative assignment.

The next communication (Appendix D) was an email with a link to their Google Document for their first collaborative writing assignment and the names of their team members. I strongly recommended students get in touch with their team members as soon as possible. I also told students not to hesitate contacting me if they needed any assistance, a point I reiterated in throughout my communications.

I did not correspond with the students for several weeks, until their second collaborative assignment was imminent. The next message (Appendix E) was a link to their second collaborative assignment. This email also included a note asking all teams to please try using Google Documents for their collaborative writing assignments, because two of the teams had decided not to use Google Documents for their first writing assignment.

My next email (Appendix F) to the students was to inform them a letter (Appendix G) would be arriving in the mail that was an invitation to participate in my research project, and if
they would please sign and return the Informed Consent Document. I followed this up two weeks later with an email (Appendix H) asking them to please sign and return the Informed Consent Document. After waiting two more weeks for additional Informed Consent Documents to arrive, I began emailing those who had signed and mailed back the Informed Consent Documents to establish times for phone interviews. Nine students agreed to participate in the research project. Once times for interviews had been confirmed, my final interaction with the students was the interview.

**Data Collection**

The data gathering technique I used in this qualitative research project was the semistructured interview. According to Esterberg (2002), the goal of the semistructured interview “is to explore a topic more openly and to allow interviewees to express their opinions and ideas in their own words” (p. 87). Merriam (1998) advises that “interviewing is necessary when we cannot observe behavior, feelings, or how people interpret the world around them. It is also necessary to interview when we are interested in past events that are impossible to replicate” (p. 72). But it is Patton (2002) who sums up the power of the qualitative interview most sublimely, saying that “qualitative interviewing begins with the assumption that the perspective of others is meaningful, knowable, and able to be made explicit. We interview to find out what is in and on someone else's mind, to gather their stories.” (p. 341).

An interview schedule/guide (Figure 1) was used for the interviews. An interview guide lists the questions or issues to be explored in the course of an interview. An interview guide is prepared to ensure the same basic lines of inquiry are pursued with each person interviewed. Patton (2002) asserts that the interview guide helps make interviewing a number of different people more systematic and comprehensive by delimiting in advance the issues to be explored.
Interview Guide

1. Other than this class, what other experiences have you had with online classes?
2. What motivated you to take this course?
3. What did you expect to learn in this class?
   Follow-up: Were your expectations met?
4. What assignments did you find easiest?
5. What assignments did you find difficult?
6. What were the best aspects of the course?
7. What were the weakest aspects of the course?
8. What activities were most beneficial?
9. How do you feel about the team project you had for the class?
10. Overall, how do you think your group got along with each other?
11. How involved were the other team members in the project?
12. Have you had other classes, either in a physical classroom or online, that had team projects?
   i. No
   ii. Yes
      Follow-up:
      i. Answer: Only online or face-to-face.
         How did this team project differ from that/those?
      ii. Answer: Both online and face-to-face.
         How do you think that they differ from each other?
         How did this team project differ from those?
13. Why do you think instructors use these kinds of collaborative team projects in their classes? What are the benefits of collaborative activities for students? Do you think that they work well for online classes?
14. If you were a teacher, would you use collaborative activities with your students?
   i. No
      Follow-up: Why not?
   ii. Yes
      Follow-up: Would you use Google Docs for a collaborative project?
      i. No
         Follow-up: Why not?
      ii. Yes
         Follow-up: How do you think you would use it with your students?
15. Were you already familiar with Google Docs before using it in this class?
   i. Yes
      Follow-up: How did you use it?
   ii. No
      Follow-up: Did you review the tutorial or any of the instructional material before your team started working on its project?
      i. No
         Follow-up: Why not?
      ii. Yes
         Was it helpful? What would you change?
16. How long did it take you to become comfortable using Google Docs? Did introducing it early in the semester help when it came to the large team project?
17. While using Google Docs, did you encounter any technical problems?
   i. No
   ii. Yes
      Follow-up: What were they, and how did you try to solve them?
18. How long did it take you and the rest of your group to successfully coordinate your work on the team project in Google Docs? What problems did you have? Did you ever have difficulty accessing your files online?
19. How did your team communicate with each other?
20. How did you agree on which contributions to accept? How did you agree on which edits to accept?
21. As part of the assignment, you and your team members were required to work together on your project online at the same time. What was this experience like? Do you think Google Docs works well for this kind of collaborative activity?
22. Overall, what advantages do you see in using Google Docs for online collaborative projects?
23. Overall, what disadvantages do you see in using Google Docs for online collaborative projects?
24. Do you have any additional comments about the use of Google Docs for online collaborative projects?
The interviews occurred over a period of one week in February 2009 and ranged from 30 to 45 minutes in length. The interviews were conducted via telephone and captured digitally with the permission of the research participants. For security purposes, these digital recordings were kept in a password encrypted folder only I could access. Interviews were transcribed and these transcriptions were also secured in a password protected location.

**Data Analysis**

The qualitative data resulting from the transcription of the interviews were coded using a two-stage process of (1) open coding followed by (2) focused coding (Esterberg, 2002). Bogdan and Biklen (1998) share the following explanation of coding:

As you read through your data, certain words, phrases, patterns of behavior, subjects’ ways of thinking, and events repeat and stand out. Developing a coding system involves several steps: You search through your data for regularities and patterns as well as for topics your data cover, and then you write down words and phrases to represent these topics and patterns. These words and phrases are coding categories. They are a means of sorting the descriptive data you have collected so that the material bearing on a given topic can be physically separated from the other data. (p. 171)

**Open Coding**

Open coding involves working “intensively with your data, line by line, identifying themes and categories that seem of interest” (Esterberg, 2002, p. 158). The open-coding process began with transcripts being read several times and anything that seemed relevant, however distant from the research question, was coded. This was essentially a first pass through the rough data, attempting to break it into discrete parts.

This initial coding revealed the following codes: team communication, team coordination, importance of collaboration, feelings about/opinion of team projects, prior experience w/ team projects, methods of team communication, feelings about/opinion of gdocs,
prior experience w/ gdocs, gdocs usability/user friendliness/learning curve, challenges of group projects, challenges of collaborating online, communication and coordination, importance of socialization in online course, benefits of gdocs, and collaboration as socialization.

Once this was done, texts were re-read and closer attention paid to existing codes and patterns were looked for in the form of variability (similarity and differences). The groups of codes were reviewed and compared, and codes focusing on related issues were organized and coded into more general categories (Figure 2). Once these more general groups of codes were identified, analysis turned to focused coding.

![Figure 2. Three examples of coding from three transcripts](image)

**Focused Coding**

Like open coding, focused coding entailed going through the data line by line, but this time the emphasis was on those key themes identified during open coding (Esterberg, 2002). Initial themes were compared with each other and combined into more complete categories: the benefit of collaboration to socialization, the benefit of collaboration to critical chinking, tools
used for team communication and coordination, document management and Google Documents, collaborative writing and Google Documents, and general enthusiasm for Google Documents.

Moving forward with these five themes, I returned to the original data and read through the transcripts again. During this read-through, I copy and pasted all relevant quotes for each theme from the transcripts into individual files. By dividing the original transcripts into potential themes I intended to advance, I was able to return to the data and justify the codes I had noted during initial coding (Figure 3). This focused coding showed the relative strengths of each code and the number of participants who made statements referring to these themes.
What was the most challenging part as far as working with the other people on your team?

In my situation, I remember on the first assignment, we didn’t have any contact with one girl until the day before it was due, so that made it really difficult. We had already finished and she just added on whatever she could at the end, so that was the most challenging.

How did you go about the composing of the document?

We all pretty much worked on it at different times. We couldn’t seem to find a time to all do it together so one person would work on it, pass it to the other. Once she put her input in then it was sent to all three and we would all look at it again. After each contribution everyone reviewed.

Do you think it worked better using google docs or do you prefer email?

In previous group assignments it had just been emailing documents back and forth. I found this a lot easier, it saved a lot of time and I think as often as I have computer problems, it was nice not having to worry about losing it. And it shows what was changed, I think it was a lot handler. I think it saved a lot of time and it saved a lot of awful technical problems as well.

Managing Documents with Google Documents

Do you think it worked better using google docs or do you prefer email?

In previous group assignments it had just been emailing documents back and forth. I found this a lot easier, it saved a lot of time and I think as often as I have computer problems, it was nice not having to worry about losing it. And it shows what was changed, I think it was a lot handler. I think it saved a lot of time and it saved a lot of awful technical problems as well.

The google docs was something new for us to learn. No, I think it was fine to do something different. And I can’t think of anything that you know you made it as easy for us as possible. I can’t really think of anything that I would do differently.

I’ve been involved in other classes where they didn’t use google documents and they just didn’t understand. They just didn’t understand and I ended up doing most of the assignment. Some people just don’t understand google documents. I’m not really sure why they don’t understand it but they don’t.

What’s your feeling about using something like this for team projects?

I think it’s great, especially with online courses. If you take an online course you need to be ready for the technology. It’s bad when the technology gets in the way of the learning, that’s something I even wrote about in the course about online things is that with web teaching and stuff, they set up the course where it takes you twenty minutes just to figure out where the things you need to learn that
There were three general themes identified through this analysis, each containing two or more sub-themes. I present these themes in the following chapter.

Summary

I began this chapter with an explanation of the research design that was used, a basic interpretive qualitative study. Next, I described the design's methods for data collection, the semistructured interview, and its participants. Finally, the chapter ended with an explication of the data analysis used, a two-stage coding process, to examine the transcripts.
CHAPTER 4. RESULTS

Introduction

As previously stated, the aim of my research was to explore the usefulness of Google Documents as a collaborative writing tool for students. My research questions were:

1. Is the writing environment supportive of collaborators' text and idea sharing?
2. What are group members' experiences with this new technology?

During my examination of the research literature in chapter 2, details of an Essential Collaborative Writing Toolkit were established. This Toolkit helped immensely in answering the first research question, determining whether or not Google Documents met the specifications necessary for a successful collaborative writing environment. Later, in chapter 5, I discuss how well Google Documents' own toolkit matches up to this Essential Collaborative Writing Toolkit.

In this chapter, I endeavor to answer my second research question, discovering team members' experiences using Google Documents, through an analysis of interview transcripts of students who used Google Documents for two collaborative team projects. In the next section, Themes, I reveal the results of this analysis to determine participants' perceptions of Google Documents' usefulness as a collaborative writing tool. Following the Themes section, there is a brief discussion of additional findings and a summary of the chapter.

Themes

The analysis of my data, the interview transcripts, was conducted in a two-stage process, open coding followed by focused coding. Open coding involves carrying out an initial appraisal of the rough data, identifying early themes, and organizing these into key themes. Focused coding involves developing and refining these key themes, followed by their comparison and
merger into more complete categories, until the final themes of this analysis are revealed.

There were three final themes identified through this analysis of the data:

1. Importance of collaboration
2. Communication and coordination
3. Unique experience of Google Documents

Each of these themes and their sub-themes will be delineated in this chapter.

**Importance of Collaboration**

Students almost universally felt collaborative activities added a particular piquancy to the coursework, especially as they benefited socialization and learning. These can be understood as fulfilling two very distinct student requirements: collaboration benefiting students' emotional, affective needs through its positive influence on socialization; and collaboration benefiting students' instructional needs through its positive influence on learning.

**Benefit to Socialization**

A number of participants felt the major benefit of collaborative activities was its contribution to socialization among the students. This is especially true for those students who felt they required this interaction.

> Well I do [think collaborative team projects are beneficial], just because I'm a social person and I really enjoy working with other people. And it gives me a chance to know people from like other states, cause I'm in New York and people I worked with were from Iowa. So I just think it made me feel more connected to the class that I was in. It just made a better connection to me. And it gave me somebody else to work with and somebody else to call if I had questions on other assignments that I had to work on. [Student 1]

> [Collaborative projects] introduce you to new people and help you get to meet them. [Student 2]

> The assignments where you got to know some other people [were the best aspects
Other students voiced what is often considered one of the primary reasons for the essentialness of collaborative activities, to overcome the isolation of the online environment (Boettcher & Conrad, 2010; Lake, 1999; Lynch, 2002).

I think [collaborative team projects] are important for online classes because they are one of the only interactions you get. You can do discussion boards all day but it is the only teamwork opportunity we have. I think they are definitely beneficial for online classes especially. [Student 4]

[The two team projects] did give you a little bit of a tie to some others in the class. And it was a means for getting some discussion going, otherwise you might not have. You could have been in the class and not communicated at all with anyone else who was in the class. It was nice to have some discussion with other class members. [Student 6]

I really like working with other people and I think that’s kind of like what I miss by doing the online, so it gave me a chance to meet the students from my class. [Student 1]

**Benefit to Learning**

Some students felt the collaborative projects had benefited their learning. Curiously, they often reported this effect in descriptions mirroring the social constructivist concepts of *intersubjectivity* and *the zone of proximal development*.

Intersubjectivity, novel ways of understanding the world through the points of view of others (Ligorio et al., 2005), was experienced by students in the following ways:

*With [the collaborative activities] you kind of got to see what other people’s opinions were and...like my group members, they didn’t necessarily, maybe don’t have to work a lot with individuals, like they are used to working by themselves and so to see how they had to cope with working with someone who had a different opinion from them was somewhat interesting. [Student 3]*

*With the team projects I got to get inside the thought process of two classmates and kind of see how they would tackle it and that was interesting and informative. [Student 7]*
The sharing of ideas and thought processes is learning in and of itself. And so I thought that was beneficial for all of us. It's nice to bounce ideas off other people. [Student 2]

The zone of proximal development, the difference between a learner trying to understand a new concept alone as opposed to learning it with the help of a teacher or fellow students (Vygotsky, 1978), was experienced by students in the following ways:

[The best aspects of the course were] that you were learning from other people in the class. I always find it interesting and sometimes instructive to read when other people talk about their situations or share some of their experiences or say, “Oh yeah, I've run into this and here is what we did,” or “We didn’t know what to do and this is something that comes up quite a bit”. [Student 7]

Even if you do the readings, and do the required assignments, there are different ideas that you wouldn’t come up with yourself and just hearing other people’s thoughts and opinions on what you're taking in the class and just the discussions are really helpful. Especially in an online class when you're not in the classroom to interact and have discussions as much, so having a group project kind of helped facilitate that a little more. [Student 5]

**Communication and Coordination**

The various forms of communication used by students to coordinate their collaborative work presented itself as a major theme. These forms of communication included email, phone, and the Google Documents interface. Students also conveyed their desire for chat, a communication medium some felt was sorely missing from the Google Documents environment.

**Email**

Some teams used email as their only means of communication to coordinate their activities, especially those who co-authored asynchronously.

Yeah, the email through WebCT is how we communicated. [Student 4]
We communicated over email. We would just send emails to one another and say I've done part of the paper, why don't you look at it? That was pretty much it.
A few teams used a combination of email and phone (discussed in more detail as a sub-theme next) to manage their work.

*Email and on the phone. That’s how we decided what parts of the paper everyone would do.* [Student 5]

Alternatively, other teams used email to coordinate times to get online together and collaboratively compose synchronously.

*We would just email back and forth saying this time works for me.* [Student 2]

*We just emailed back and forth saying we have this project due, what time works for you guys, what night of the week works best, what’s our schedule look like and we just went from there.* [Student 2]

**Phone**

Some teams preferred writing/editing together synchronously and used analogous means of communication, the phone being prominent among them.

*Well we just used, just talked on the cell phone and changed stuff within the Google Documents and stuff. I mean, sometimes it’s hard if you don’t talk to people on the phone to really, oh how do I want to say it, to get an assignment done and for everyone to feel like they had an equal part in it. Cause sometimes you can do a group assignment and one person is going to end up doing all the work but I think if you actually get on the phone and talk to people then everyone at least are forced to be part of the project.* [Student 3]

*I mean we could do the email or do the Google Docs but then you didn’t know when the person was checking that so we would call each other on the phone to talk about what different parts everyone was going to do and when the deadlines were and when we had to have stuff finished.* [Student 5]

**Google Documents**

A fascinating result of dissecting the transcripts was my discovery that many of the teams used the Google Documents interface to communicate with one another in real-time as they
wrote/edited together synchronously, utilizing it the same way they would a chat or instant messaging tool.

[We] were on at the same time, so we were able to chat and send comments back and forth and just kind of correct each other’s notes or comment when they were working. I think that happened two or three times. I just would send a message through Google Docs and, you know, it would take a little bit to see it but they would respond to whatever I typed in, like in the paper. So it wasn’t like a full chat session but we were still chatting. The response time is delayed. [Student 1]

We just kind of had a conversation going on at the bottom so after someone would write something in, it was always “what do you think” and the other two would comment “yes” “no” “maybe” “let’s change the wording this way” or “change it that way”, and it kind of took a while to make sure it was ok with everybody. We just scheduled a time where we could all three get online at the same time and log in. Then we could instantaneously communicate that way. [Student 2]

As we were in the document, it was almost like we were doing a chat inside the document and then we would erase what was chatted and add what was our pieces. Like somebody would write something and somebody else would say, “That looks good. I really like that. And what about this?” And the original person might write something, and the person who is commenting would say, “Put something there.” So it was like we were chatting inside the document but also editing it at the same time. [Student 6]

**Chat, the Missing Element?**

Several interview participants indicated it would have been helpful for their team's communication if a chat feature had been built into the Google Documents interface.

*I think a chat window would be beneficial. I mean I guess that’s why we were on the phone, cause we didn’t have another way to really communicate because you kind of have to pay attention because you have to go back and you have to know that there's revisions. [Student 3]*

*A built-in chat area would have been nice. I mean it worked the way we did it, too, but... [Student 2]*

*It would have been helpful if chat had been built into Google Docs. [Student 5]*

Ultimately, what was most amazing about this theme, Communication and Coordination,
was not students' various means of communication, instead it was their frequent need to coordinate their writing activities in a synchronous fashion. Even when they used an asynchronous tool like email, it was often employed to help teams organize times for simultaneous collaborative writing. The phone, although an inherently imperfect tool for team communication (e.g., possible incursion of long distance charges for team members, potential lack of conference calling capabilities for teams, cumbersome coordination of physically holding phone while typing, etc.), was used repeatedly to facilitate synchronous collaborative writing. But this requirement of teams to communicate as they composed together in real time was made especially acute by their use of the Google Documents interface to write messages, make requests, and coordinate activities with each other. This further underscores the desire of some participants for Google Documents to have an integrated chat tool to more easily promote communication and coordination.

**Unique Experience of Google Documents**

Students frequently spoke of their use of Google Documents as having been a unique experience. These experiences can be divided into three sub-themes: managing documents with Google Documents, collaborative writing with Google Documents, and a general enthusiasm for Google Documents.

**Managing Documents with Google Documents**

Many participants indicated that prior to using Google Documents, email had been the primary means of managing documents for their collaborative writing projects.

_As far as managing the projects prior to Google Docs online...we would correspond through WebCT and our just general email, sending the document back and forth that way. So then we would have to wait for one person to get done with the document and send it and vice versa. [Student 1]_
In previous group assignments it had just been emailing documents back and forth. [Student 4]

The other team projects we’ve done...it was email back and forth, and change, and try and set everything up that way. [Student 2]

Alternatively, Google Documents' files are accessed and managed via the internet. As long as the students had a connection to the internet, they could access and edit their documents from anywhere.

Google Docs is really nice and made the team projects easy. Being able to have that kind of all online...people could go in and work on it as they wanted rather than sending the document back and forth. I took a class in the fall of 2007 with Dr. R. that was online. We had to do group projects for that too. That was a little more difficult because we were just emailing our word documents back and forth. So having Google Docs would have really helped there. [Student 5] [Google Docs] was more useful than trying to make changes, emailing different versions back and forth. [Student 6]

Collaborative Writing with Google Documents

Participants often described in detail the singular experience of writing collaboratively with Google Documents. Often these experiences bordered on the exuberant.

You could write in real time, together, and that’s what our group did. We set a time and so we were all on the document at the same time, rather than working at it at various different times, and so that way we could all be in it, and we could see what another person was writing. [Student 6]

Google Docs is really nice and made the team projects easy. Being able to have that kind of all online...people could go in and work on it as they wanted rather than sending the document back and forth. [Student 5]

We actually all got online at once and then somebody would type something and then you could respond right away with Google Docs. That was so nice to be able to format our page. And before you had to…you wrote a paragraph and sent it to everybody and added it all together, and this way we can just write the paper as a team without being anywhere close to each other. Yeah it worked out. We loved it. [Student 2]
A General Enthusiasm for Google Documents

There was a pervasive attitude amongst the students most easily described as a feeling of general enthusiasm for having used Google Documents.

Yeah, I thought using Google Docs went great and I would do it again. [Student 2]

I would absolutely use this in other online courses. I think even outside the online courses, like in a workplace or something, would be a good way to share minutes in a meeting or an agenda or any sort of document you were working on with colleagues. [Student 5]

Oh yeah, I'd love using Google Docs to work on collaborative team projects in other courses. I'd be all for it. [Student 1]

I think Google Docs is great, especially with online courses. If you take an online course you need to be ready for the technology. It's bad when the technology gets in the way of the learning. That's something I even wrote about in the course, about online things, is that with web teaching and stuff, if they set up the course where it takes you twenty minutes just to figure out where the things you need to learn that week are, then the technology is getting in the way. And for those courses, I just get so frustrated because I can't get to the information I need. And so, something like Google Docs, it's so easy. You know you have a link, and I think I even set it up in my favorites for the first assignment so I could just go in and say, this is what she did last night. And so I think there are a lot of other free online technologies that professors could incorporate that would add to their course rather than take away. But I think students who take online courses have to be ready for that and be open to it and that might be an issue. You know people get stuck in a rut, and people don't want to learn something new with technology. You know, "I'm used to what I've done and so I'll just stick with that," and that's kind of a problem. But as far as using new things in the future, that's great and I think when the professor knows the technology well and can be excited about including it in the course, it's even better. [Student 9]

Additional Findings

Aside from three general themes identified in the coding, some interesting descriptive data also emerged from the interviews. For example, all research participants had prior experience with online classes and online collaborative projects. This is not surprising since all but two of the participants were in the online Master of Science in Agricultural Education.
Somewhat surprising was finding out that five of the nine had prior (but varying degrees) of experience with Google Documents.

**Summary**

I began this chapter with an explanation of how the analysis of interview transcripts of students who used Google Documents for two collaborative team projects would help me answer my second research question: What are group members' experiences with this new technology? In this case, the new technology was the collaborative writing environment of Google Documents.

Next, in the Themes section, I revealed the results of my data analysis to determine participants' perceptions of Google Documents' usefulness as a collaborative writing tool. What arose from the analysis was the development of three primary themes and their accompanying subthemes:

I. The importance of collaboration  
   i. Benefit to socialization  
   ii. Benefit to learning  

II. Communication and coordination  
   i. Email  
   ii. Phone  
   iii. Google Documents  
   iv. Chat, the missing element?  

III. Unique experience of Google Documents  
   i. Managing documents with Google Documents  
   ii. Collaborative writing with Google Documents  
   iii. A general enthusiasm for Google Documents

I ended this chapter with a brief discussion of additional findings. In the following chapter, I synthesize the findings of my data analysis with the quality of Google Documents' own collaborative writing toolkit.
CHAPTER 5. FINDINGS, CONCLUSIONS, RECOMMENDATIONS

Introduction

This paper was an examination of Google Documents’ suitability as a collaborative writing environment for students. My two-pronged investigation included 1) a review of the literature to determine the standards of a successful collaborative writing environment and 2) interview transcript analysis of students who utilized Google Documents for two collaborative team projects.

Chapter Organization

This chapter is divided into Findings, Conclusions, and Recommendations. The Findings section takes the two prongs of my investigation and synthesizes them to create a balanced assessment of Google Documents' collaborative writing environment. The Conclusions section provides a final appraisal of Google Documents' value as a collaborative writing environment. The Recommendations section offers suggestions for changes and improvements to Google Documents in order for it to meet all criteria of The Essential Collaborative Writing Toolkit.

Findings

Summary of Findings

My research revealed that Google Documents, with little exception, is an appropriate collaborative writing environment for students. Google Documents met nearly all of the standards of a successful collaborative writing environment carefully elaborated in the section of chapter 2 entitled "The Essential Collaborative Writing Toolkit". To summarize, The Essential Collaborative Writing Toolkit is composed of six categories: The Fundamentals, Role Control, Version Control, Synchronicity, Awareness, and Communication.
The Fundamentals

Google Documents' toolkit has The Fundamentals: it satisfactorily simulates the most common word processing applications (Malcolm & Gaines, 1991); it is technically agnostic, being able to run on virtually any web browser, operating system, and/or hardware platform (P. Lowry, Nunamaker, Booker, Curtis, & M. Lowry, 2004); and it is free of geographic and temporal constraints (Kanselaar, G. Erkens, Prangsma, & Jaspers, 2002).

Role Control

Google Documents' toolkit also has Role Control. Google Documents supports multiple owners of documents (Prilla & Ritterskamp, 2006). It has a mechanism in place controlling writers’ permissions to access, view or edit documents (Chang et al., 1995; Klemm, 2005; P. Lowry et al., 2004; Posner & Baecker, 1992). Google Documents also has the means to protect collaborators’ privacy by keeping unauthorized users from accessing collaborators’ documents (Malcolm & Gaines, 1991).

Version Control

Google Documents' toolkit includes Version Control. Google Documents can reliably maintain a unique version of the collaborators’ document at all times (Chang et al., 1995; Malcolm & Gaines, 1991). Google Documents can also highlight differences between versions of a document (Malcolm & Gaines, 1991), show who has made changes to a document (P. Lowry et al., 2004; Posner & Baecker, 1992), and can revert to a previous version of a document if necessary (Malcolm & Gaines, 1991).

Synchroneity

Google Documents has Synchroneity. Collaborators can work on documents at the same
time with each other (Blasco et al., 1999; Chang et al., 1995; P. Lowry et al., 2004; Posner & Baecker, 1992; Youngblood & West, 2008). But Synchroneity is one area where an improvement could be made to the Google Documents collaborative writing environment. According to Korpilahti and Koskinen (2006), synchroneity should include a level of awareness where collaborators can see each others' edits in real time. Google Documents collaborators' work is not shown to one other in real time, but with a delay ranging from seconds to minutes. Being able to see others' edits in real time would be an important enhancement to the Google Documents.

**Awareness**

Google Documents has Awareness. Collaborators are made aware of others' presence in the document through small, colored boxes containing collaborators' names appearing at the bottom of the document. But like Synchroneity, Awareness is another standard that could be improved in Google Documents. In fact, Awareness and Synchroneity are very closely tied together because collaborators need to remain conscious of each other’s contributions and activities as they work together in the document (Korpilahti & Koskinen, 2006).

This improvement would be piggybacked onto the one proposed for ameliorating Synchroneity. Whereas, to enhance Synchroneity, it has been proposed collaborators have the ability to see each other working on a document together in real-time, in order to improve Awareness it is suggested each collaborator has a different color for their edits (Posner & Baecker, 1992; Reinhard, Schweitzer, Völksen, & Weber, 1994), or each collaborator's cursor has a unique shape (Blasco et al., 1999; Reinhard et al., 1994).

**Communication**

Google Documents has an integrated communication tool, commenting, and also
provides collaborators easy access to their email accounts. Email is important for team members because of its ubiquity and common use. It is an asynchronous way for collaborators to negotiate, coordinate, and connect (P. Lowry et al., 2004; Malcolm & Gaines, 1991; Posner & Baecker, 1992; Reinhard et al., 1994; Yilmaz, 2008).

Google Documents' commenting tool allows teammates to maintain an asynchronous, contextual dialogue (Cerratto, 2002; Chang et al., 1995; Klemm, 2005; Leland, Fish, & Kraut, 1988; P. Lowry et al., 2004; Malcolm & Gaines, 1991; Neuwirth, Kaufer, Chandhok, & Morris, 1990; Posner & Baecker, 1992). These comments, or annotations, are the basis for discussions of plans, coordination, negotiation, and revision (Cerratto Pargman, 2003).

The one communication tool conspicuously absent from the Google Documents collaborative writing environment is chat. Chat can provide team members immediate feedback and greater social presence (Holmes & Gardner, 2006). The inclusion of an integrated chat tool would benefit Google Documents' collaborators (Gijsbert Erkens, Andriessen, & Peters, 2003; Kanselaar et al., 2002; Leland et al., 1988; Posner & Baecker, 1992; Yilmaz, 2008).

**Major Findings: The Google Documents’ Toolkit**

In essence, determining Google Documents’ suitability as a collaborative writing environment for students ultimately comes down to an analysis of the tools in its toolkit. In brief, here are the tools detailed in chapter 2 determined as essential to the collaborative writing toolkit:
The Fundamentals
- satisfactorily simulates the most common word processing applications
- technically agnostic
- free of geographic and temporal constraints

Role Control
- control of collaborators’ permissions
- protects collaborators’ privacy

Version Control
- reliably maintains a unique version of the collaborators’ document at all times
- tracks the document’s development, including who made changes and highlighting differences between the text of various versions of the document

Synchroneity

Awareness

Communication
- email
- commenting
- chat

In the Findings section, I perform a comparison of Google Documents' tools to the essential collaborative writing toolkit set forth in chapter 2. This comparison is synthesized with students' impressions of Google Documents, thus creating a more balanced assessment of Google Documents' collaborative writing environment.

**Google Documents and the Fundamentals**

*Satisfactorily Simulates the Most Common Word Processing Applications*

The Google Documents user interface very closely approximates the most common word processing applications (Figure 4). Most of the research participants without prior experience using Google Documents found its interface familiar and easy to use. Typical of this attitude, one participant said

*I just sort of dove right in and started using it. It was pretty easy to figure out, I thought.* [Student 1]
Another student echoed this sentiment, stating

*I liked Google Docs, using it. I never had any experience working with it whatsoever and I enjoyed using it.* [Student 4]

![Figure 4. Google documents user interface](image)

**Technically Agnostic**

Table 1 illustrates that Google Documents runs on the most commonly used web browsers and operating systems, thus making it virtually technically agnostic. Students never complained of not being to access Google Documents because they were using an unsupported browser or operating system.

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<th></th>
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<th>Windows Vista and Windows 7</th>
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<th>MAC OSX 10.4 +</th>
<th>MAC OSX 10.3.9 and below*</th>
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</table>

*Table 1. Browsers and operating systems that work with Google Documents*

(“System requirements : Getting to know Google Docs - Google Docs Help,” n.d.)
One participant commenting on this technical agnosticism, said

*I think Google Docs is great. It’s bad when the technology gets in the way of the learning. Something like Google Docs, it’s so easy.* [Student 9]

**Free of Geographic and Temporal Constraints**

There are no known geographic or temporal constraints to accessing Google Documents as long as a user has a connection to the internet. This ease of access, regardless of time or place, was noted by the research participants. One student remarked

*I've been in groups where everybody waits till the last minute, but I thought that this way we were each able to post at our own rate, and being able to go back through and read what everybody else had, and make little changes here and there really helped, and with it being a working document.* [Student 2]

Another participant reiterated this perspective, announcing

*Google Docs is really nice and made the team projects easy. People could go in and work on it as they wanted rather than sending the document back and forth.* [Student 5]

**Google Documents and Role Control**

Role control in Google Documents is very simple to administer. I created a document for each team's collaborative writing assignment. I gave collaborators editing and viewing privileges only for their team's documents. The course instructor was granted editing and viewing privileges for all team documents. This process was transparent and unacknowledged by the participants.

**Google Documents and Version Control**

Fidelity of the working document is very important when composing with word processing software. This is especially true with a tool like Google Documents where the possibility of a browser crashing or losing internet connectivity always exists. Google
Documents compensates for these contingencies by auto-saving the working document every few seconds. As one student stated

*As often as I have computer problems, it was nice not having to worry about losing it.* [Student 4]

Version control is also important for keeping track of earlier versions of a document. This allows collaborators to be mindful of who has made which changes to a document, or, if they find it necessary, revert to an earlier version of a document. The same student also commented

*Google Documents saved a lot of time. It shows what was changed.* [Student 4]

Google Documents maintains a continuous, detailed record of a document's edits and who has made them (Figure 5). Within Google Documents, collaborators can also easily compare different versions of a document to see how they vary.

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Google Documents and Synchroneity

Google Documents allows ten people to edit a document at the same time. Collaborators do not see edits in real time. There is a delay of several seconds before collaborators see others' changes. Although this delay might not seem to be particularly user-friendly, or optimal for true
synchronous collaborative writing, participants did not remark on it contributing negatively to their experience. One student, remarking on team members writing together synchronously, said

> You could write in real time, together, and that’s what our group did. We set a time and so we were all on the document at the same time, rather than working at it at various different times, and so that way we could all be in it, and we could see what another person was writing. [Student 6]

**Google Documents and Awareness**

In Google Documents, when team members simultaneously edit a document, they are made aware of each other’s presence by uniquely colored boxes appearing at the bottom of the screen, each containing a different collaborator's name (Figure 6).

In most cases where students worked on a document synchronously, Google Documents' capacity to raise team members' awareness to each other appeared satisfactory. Indicative of this is a participant who said

> We actually all got online at once and then somebody would type something and then you could respond right away with Google Docs. That was so nice. Yeah it worked out. We loved it. [Student 2]
Google Documents and Communication

Email

Google Documents provides collaborators easy access to their email accounts (Figure 7). It makes perfect sense to have this time-tested, asynchronous communication channel readily available to Google Documents users. This sentiment was reflected in participants’ comments that email was very often used to correspond with each other. For example, one student stated

*We communicated over email. We would just send emails to one another and say, "I've done part of the paper, why don't you look at it?"* [Student 8]

Commenting

In-line commenting gives collaborators another means of asynchronous communication in Google Documents (Figure 8). Research participants did not indicate using the commenting feature nearly as often for asynchronous communication as email, but some did use it as a synchronous chat tool. For instance, one participant said

*I would send a message through Google Docs and, you know, it would take a little bit to see it but they would respond to whatever I typed in, like in the paper. So it wasn’t like a full chat session but we were still chatting. The response time is delayed.* [Student 1]
Chat

Google Documents does not have an integrated chat feature. As I previously stated in the Commenting section, some participants signaled that, in lieu of a built-in chat tool, they had tried using the Google Documents interface itself as an ad hoc chat tool for synchronous communication. This typically involved team members writing messages directly in the document for each other. Because of the delay in a document auto-saving and updating changes for all users, this “chatting” often more closely resembled an asynchronous tool like email.

Several interview participants indicated it would have been helpful for team communication if a chat feature had been integrated into Google Documents. One student said

*I think a chat window would be beneficial. I guess that’s why we were on the phone, cause we didn’t have another way to really communicate.* [Student 3]

Conclusions

Google Documents met nearly all of the standards of a successful collaborative writing environment. This, combined with the fact that the study's participants' responses to the collaborative writing environment were almost unanimously positive, demonstrate Google Documents is a suitable collaborative writing environment for students.
Equally important as demonstrating that Google Documents is a successful collaborative writing environment for students, is showing that my research findings have made a contribution to the literature. My findings make clear that Google Documents (one among a host of similar collaborative writing environments that are commercially produced or open source, free, and incredibly intuitive to use) offers a common-sense, low-to-no-cost means for institutions of higher learning to address the challenge of imparting collaborative writing skills to students.

I also hope the framework (Figure 9) I set forth in *The Essential Collaborative Writing Toolkit* can be used by educators of all stripes. It promises to offer them a straightforward means to assess collaborative writing environments, something noticeably missing until now.

<table>
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<th>The Fundamentals</th>
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<td>o satisfactorily simulates the most common word processing applications</td>
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<tr>
<td>o technically agnostic</td>
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<td>o free of geographic and temporal constraints</td>
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<th>Role Control</th>
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<td>o control of collaborators’ permissions</td>
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<th>Version Control</th>
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<td>o reliably maintains a unique version of the collaborators’ document at all times</td>
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<td>o tracks the document’s development, including who made changes and highlighting differences between the text of various versions of the document</td>
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<th>Synchronicity</th>
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Figure 9. *The Essential Collaborative Writing Toolkit* Framework

Google Documents is by no means perfect though, and there are areas of improvement that can make it an even better collaborative writing environment. These recommendations are outlined in the next section.
Recommendations

Notwithstanding the conclusion that Google Documents is a suitable collaborative writing environment for students, meeting almost all of the essential writing toolkit standards, there is still substantial room for improvement. I detail these shortcomings and how they may be alleviated in the following sections: Synchronicity and Awareness, and Communication Tools.

Synchronicity and Awareness

Although Google Documents collaborators can work on a document at the same time with each other, they cannot immediately see where each one is working in the document. Being able to see others' edits in real time would be an important enhancement to the Google Documents (Korpilahti & Koskinen, 2006).

Communication Tools

Communication tools are probably Google Documents greatest weakness. The asynchronous commenting tool in Google Documents needs to be more analogous of word processing software like Microsoft Word. Google Documents adds comments in-line with the main body of the text. A document with many comments can appear cluttered and difficult to read. Instead, comments should be added to the margins of the document where they do not interfere with the flow of the text.

Google Documents lacks a synchronous communication tool, i.e. chat. An integrated chat tool would greatly benefit collaborators. The immediate feedback it provides team members is an often needed, alternative avenue of discourse (Holmes & Gardner, 2006).

Epilogue

These are really the thoughts of all men in all ages and lands, they
are not original with me,

If they are not yours as much as mine they are nothing, or next
to nothing,

If they are not the riddle and the untangling of the riddle they are
nothing,

If they are not just as close as they are distant they are nothing.

— Walt Whitman, *Leaves of Grass from Song of Myself*

Although the purpose of this study was to determine the suitability of Google Documents
as a collaborative writing environment for students, what underlay this interest was my profound
belief in collaborative writing’s power in the classroom to benefit students both socially and
academically. Collaborative writing can be understood as just another form of collaborative
learning among many, but it is really much more than this. Collaborative writing is, to paraphrase
Whitman, really the thoughts of all team members, organized and made real on paper or an
electronic document.

I consider collaborative writing to be one of the very few forms of group work that can
prove to be as important to students’ work after college as it is to students’ learning in the college
classroom. Collaborative writing appears to be an academic exercise whose relevance will only
continue to rise, especially with the ever-increasing arrival of newer technology like Google
Documents that can easily be appropriated for educational uses. If Google Documents' collaborative writing environment continues to improve by incorporating all of the tools in the
essential writing toolkit, then it is my opinion students will make even greater achievements in
and out of the classroom.
APPENDIX A. INTRODUCTORY MESSAGE

Hello AgEdS 520 Student,

My name is Todd Vens and I am an instructional designer for the College of Agriculture and Life Sciences. I am also a graduate student in Curriculum and Instructional Technology. I am writing you because of two upcoming class assignments that are collaborative in nature. For these collaborative projects you will be split into teams of three and required to use Google Docs. I know that you may be totally unfamiliar with Google Docs, but not to worry, because I will be orienting you in the use of Google Docs.

The first collaborative project will be for assignment 11 - "The discussion method is considered to be best by many adult educators. Why?" - in your syllabus. Although the use of Google Docs will require you to work outside of the familiar WebCT environment, the hope is that this new online technology, with its emphasis on collaboration, will help with your team projects’ development and also inspire new ideas for collaborative activities in your own classrooms.

I will be in contact with you again very soon.

Sincerely,

Todd Vens

College of Agriculture and Life Sciences
Brenton Center, 4 Curtiss Hall
Iowa State University
Ames, Iowa 50011
515.294.5948
APPENDIX B. TUTORIAL MESSAGE

Hi,

Please click on this link and review the material on the web page I put together on how to use Google Docs. You can also email or call me any time if you have questions.

http://www.brenton.iastate.edu/dcr/gdocs_tutorial/gdocs_tutorial.htm

I will be sending out your team assignment tomorrow, and also include the link to your Google Docs workspace for assignment 11.

Sincerely,

Todd Vens

College of Agriculture and Life Sciences

Brenton Center, 4 Curtiss Hall

Iowa State University

Ames, Iowa 50011

515.294.5948
Google Docs: A New Way for Students to Create, Collaborate On, and Share Documents Online

Online learning has become an alternative but let's reconsider the intro here. -Todd Vens 7/19/08 12:19 AM

Ok, I agree. But what do you want it to say? -Todd Vens 7/19/08 12:23 AM

Ubiquitous global education platform for millions of people. The preponderance of courses designed for the online environment are asynchronous in nature, meaning that students and instructors never have to temporally share the same virtual learning space. From instructors' recorded lectures streamed across the Internet to students' threaded discussions, asynchronous instruction has pervaded online learning because of the historically available technology (software and hardware) it was built upon. The designers of this technology (what is now commonly referred to as Web 1.0) understood the web browser, and therefore the Internet, as a delivery mechanism. For end-users, the "experience" of the Internet was one of passivity. Within the last three years a new generation of web technology development, reciprocally and iteratively driven by end-users, has emerged as an alternative model to Web 1.0. Not surprisingly this has been coined Web 2.0. It has many features that distinguish it from the "old" web. An excellent video defense of Web 2.0 is available on YouTube.
APPENDIX D. FIRST COLLABORATIVE ASSIGNMENT

I've shared a document with you called "Assignment 11":
http://docs.google.com/a/iastate.edu/Doc?id=dc2r2ktz_7ftzbsmd7&invite=gnfdspj

It's not an attachment -- it's stored online at Google Docs. To open this document, just click the link above.

---

Your team for Assignment 11 is ------ -------, ------- -------, and --- -----. I would recommend that you get in touch with your team members as soon as possible. Before you begin to work collaboratively on your assignment, get familiar with Google Docs by clicking on the link in this message and signing in to the "Google Apps for Iowa State University" web site. You will have to create an account for the "Google Apps for Iowa State University" web site if you have not yet done so. Remember that you can contact me if you need any assistance with Google Docs.

Thank you,

Todd
APPENDIX E. SECOND COLLABORATIVE ASSIGNMENT

Hello,

Your team for the Second Collaborative Assignment is the same.

Please do not hesitate to contact me if you have any questions regarding the use of Google Docs. Wade and I noticed that there were two teams that did not use Google Docs at all for the first collaborative writing assignment, and we really want to encourage you to use it.

Like I said before, Google Docs is a tool that was specifically designed with collaboration in mind and our genuine hope is that it will assist you in completing this collaborative assignment.

Thanks,
Todd Vens

Team 01 - Second Collaborative Assignment
http://docs.google.com/a/iastate.edu/Doc?id=dc2r2ktz_26gfxq45tp&invite=
APPENDIX F. MESSAGE ABOUT INFORMED CONSENT DOCUMENT

Dear AgEdS 520 Student

Within the next 2 to 3 days you should be receiving a letter from me in the mail. This letter is an invitation to participate in a research study. The purpose of this study is to investigate your use of Google Docs in AgEdS 520. It is hoped that the information gained from this study will help those faculty teaching online courses to develop new instructional methods that better meet students’ needs.

To be a part of this study, you will need to sign the Informed Consent Document and mail it back to me in the return, stamped envelope. Your participation will consist of a short interview at the end of the Fall 2003 semester. I will contact you at the end of the semester to set up a time to interview you by phone. The interview should take about 30 minutes. If I have any follow-up questions for you, I will send them by email.

I hope that you will be a part of this study. This opportunity to discuss your experience may help other students taking online courses in the future.

Sincerely,

Todd Vero

College of Agriculture and Life Sciences

Brenton Center, 4 Curtiss Hall

Iowa State University

Ames, Iowa 50011

515.294.5048
APPENDIX G. INFORMED CONSENT DOCUMENT WITH

INTRODUCTORY LETTER

INTRODUCTORY LETTER

8/12/2010

Todd Vens
College of Agriculture and Life Sciences
Brenton Center, 4 Curtiss Hall
Iowa State University
Ames, Iowa 50011

Dear ----- --------:

I would like to invite you to participate in a research study. The purpose of this study is to investigate your use of Google Docs in AgEdS 520. If you agree to participate in this study, your participation will consist of a short phone interview at the end of the Fall 2008 semester. The interview will be transcribed and (along with your team’s second Google Docs project) analyzed. It is hoped that the information gained from this study will help those faculty teaching online courses to develop new instructional methods that better meet students’ needs.

Your participation is entirely voluntary. If you wish to be part of this study, please complete the section of the Informed Consent Document entitled PARTICIPANT SIGNATURE. Insert the Informed Consent Document into the return, stamped envelope and mail it back to me. I will contact you at the end of the semester to set up a time to interview you by phone. The interview should take about 30 minutes. If I have any follow-up questions for you, I will send them by email.

I hope that you will be a part of this study. It is an opportunity to discuss your experiences and help other students taking online courses.

Sincerely,

Todd Vens
INFORMED CONSENT DOCUMENT

Title of Study: Student Experiences of Collaboration in an Online Course

Investigators: Todd Vens

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to investigate students' use of Google Docs in an online learning environment. You are being invited to participate in this study because you are a student in AgEdS 520.

DESCRIPTION OF PROCEDURES

If you agree to participate in this study, your participation will consist of a phone interview at the end of the fall 2008 semester. Any follow-up questions will be sent by email. An analysis of the transcribed interviews and the team's second Google Docs project will be performed.

All interview recordings will be erased in July 2009.

RISKS

While participating in this study you may experience the following risks:
There are no foreseeable risks at this time from participating in this study.

BENEFITS

If you decide to participate in this study there may be no direct benefit to you. It is hoped that the information gained in this study will benefit society by providing valuable information about educational uses of new technology.

COSTS AND COMPENSATION

You will not have any costs from participating in this study. You will not be compensated for participating in this study.

PARTICIPANT RIGHTS

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled.
CONFIDENTIALITY

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken. Recorded conversations will be locked in a secure location of which only the principal investigator will have access. The recorded material will be erased in May 2009. If the results are published, your identity will remain confidential.

QUESTIONS OR PROBLEMS

You are encouraged to ask questions at any time during this study.

- For further information about the study contact Todd Vens, (515) 294-5948, trvens@iastate.edu, or Dr. Wade Miller, 515-294-0895, wwmiller@iastate.edu.

- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office of Research Assurances, Iowa State University, Ames, Iowa 50011.

PARTICIPANT SIGNATURE

Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document and that your questions have been satisfactorily answered. You will receive a copy of the written informed consent prior to your participation in the study.

Participant’s Name (printed) __________________________________________________________

(Participant’s Signature) ____________________ (Date)

INVESTIGATOR STATEMENT

I certify that the participant has been given adequate time to read and learn about the study and all of their questions have been answered. It is my opinion that the participant understands the purpose, risks, benefits and the procedures that will be followed in this study and has voluntarily agreed to participate.

(Signature of Person Obtaining Informed Consent) ____________________ (Date)

ORA 10/06
APPENDIX H. FOLLOW-UP LETTER

Dear AgEd S 520 Student

A couple of weeks ago you should have received in the mail an invitation to participate in a research study. Dr. Miller and I would like to thank those of you who have already signed and returned the Informed Consent Document. If you have not already done so, Dr. Miller and I urge you to please consider signing and returning the Informed Consent Document within the next couple of days.

If you have signed and returned the Informed Consent Document or plan on doing so, I will contact you during the week of January 5th to set up a very short phone interview.

Sincerely,

Todd Vena

College of Agriculture and Life Sciences

Brenton Center, 4 Curtiss Hall

Iowa State University

Ames, Iowa 50011

515.294.5948
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I also wish to recognize my friends, colleagues, and children for their constant support and encouragement. Lastly, and most importantly, I want to thank my wife, Lisa Burke, for all of her love and wonderful support during this process. It has finally come to an end. I love you forever.