

Collaborative Writing in Composition: Enabling Revision and Interaction Through Online Technologies

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ABSTRACT

As online education grows in popularity, the literature on such courses has expanded as dramatically. However, discussion of online tools specifically for composition instruction has received far less attention than general course-management systems and online discussion forums. The composition process has changed with the advent of computer processing, yet composition research rarely focuses on the advantages of the digital composition process. That process could change again with recent developments in social systems and networked, cloud-based applications. This article highlights the way online composition platforms can meet the needs of writing courses. New tools can provide new opportunities for student collaboration, teacher involvement, and writing-process research. This article uses Sally J. McMillan's model of Cyber-Interactivity and Robert R. Johnson's model of User-Centered Design as frameworks in which to view collaborative writing, arguing that students in online composition courses need collaborative tools that allow a single document to be created by a student, edited by others, and commented on by all. The ill-fated Google Wave platform is evaluated through this perspective. Practical benefits of the platform and implications for writing instruction are included. Collaborative online composition, using systems with features like Google Wave, is presented as essential in modern composition courses.

Keywords: Collaborative Composition, Instructional Design, Instructional Technology, Online Education, Peer Review

INTRODUCTION

Both composition and course design present particular dilemmas that prevent online composition courses from matching quality of experience seen in standard face-to-face classes. Additionally, classes taught via computer should be able to use the medium as a tool to better

understand and work with the act of writing, which is now done using those same computers. Online composition courses need to employ a system that allows composition teachers to witness the process of writing without needing to rely on formal draft stages and provides a forum for true peer-to-peer collaboration instead of simply communication. Using the theories

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of Nancy Sommers, Sally J. McMillan, and Robert R. Johnson, I will show that such a system (previously available with Google's Wave platform) would appropriately address current course-design concerns, support the pressing need for social and collaborative learning in online environments, and emphasize the role of revision in writing.

Early research into the process of writing involved asking students to "think out loud" while composing essays, journal entries, or other specific assignments given by either instructors or researchers (Crowley, 1977; Emig, 1971; Perl, 1979). In order to better understand the writing process used by students outside a laboratory environment, researchers developed studies that addressed the artificial nature of previous work and drew attention to the variety of steps involved in creating a written work (Berkenkotter & Murray, 1983; Flower & Hayes, 1981; Rose, 1980). Despite efforts to the contrary, researchers continued to confess that the only observable element in the writing process is the product it created. The continued emphasis on researching process, rather than the observable product, created some dissension (Horowitz, 1986). However, the focus of research turned from the overall writing process to a particular interest in revision, now accepted as a critical step in the production of good writing (Hawkins, 1980; Sommers, 1980; Yagelski, 1995). The meaning of the word "revision" differs between students and teachers: student revisions tend toward the surface level only, while teachers expect deeper and more thorough changes. More recent research has focused on helping students understand the benefits of deep revision, and one common instructional method is the use of peer revision, which is effective in regular, ESOL, and special-education courses (Ferris, 1997; Haaga, 1993; McGroarty & Zhu, 1997; Paulus, 1999; Stoddard & MacArthur, 1993; Topping, 1998; Wallace & Hayes, 1991). By evaluating the papers of their peers, students become more critical of their own writing and more aware of the expectations of the writing situation. Paradoxically, as distance learning grows in popularity, composition students are

increasingly distanced from peer review, often writing alone and submitting without input from classmates. Students need a system for facilitating online collaborative writing, and instructors need a system that emphasizes revision over completion. As I will show, Google's discontinued Wave platform provided such a solution. I will argue that a similar platform would benefit both classroom practice and composition research.

Whereas composition research has traditionally focused on student processes, research into online courses typically focuses on the Course Management System (CMS), the uptake of those systems by students, and student perceptions of the quality or ease-of-use of the CMS. Enhancements to the feature set of a CMS are driven more by technological development than by instructional methodology, such as the addition of "blog-style" discussion boards in response to the explosive popularity of blogging, rather than in response to a demonstration of pedagogical necessity. The evaluation of a CMS often focuses on the user interface or the features offered by a specific product, not on a specific student need or whether a feature is academically relevant (Gillet, Latchman, Salzmann, & Crisalle, 2001; Ovidia, 2010; Treviranus, 2009). Student communication styles are most often studied in terms of whether those communications are asynchronous or synchronous (Curtis & Lawson, 2001; Hirumi & Bermúdez, 1996; Jahng, Nielsen, & Chan, 2010; Klemm, 2005). More recently, studies have evaluated whether online student work can be considered truly collaborative given the limitations and abilities of current software (Paulus, 2005). Studies of student perceptions of online learning often find that students' interest in a course is directly proportional to the level of active engagement; the online format itself does not substantially contribute. Indeed, actively engaging students with the course material is notably more difficult online than in person due to the lack of presence. The literature on online course design is severely lacking in evaluations of the affect of these courses on student engagement and their feelings toward both class and

learning. The limited research available that assesses student responses to online learning often considers student emotional involvement difficult to directly address, focusing instead on the number of times a particular feature is used (Hall, 2010; Ioannou & Hannafin, 2000; Barbour, 2008). Instead, research should emphasize the role of the student above the role of the technology. By allowing the student to be the focal point of decision-making for online systems, online classes could be made more relevant, more engaging, more practical, and better suited to meeting the needs and learning styles of today's students.

THE PROCESS OF COMPOSITION: REVISION AS ESSENTIAL

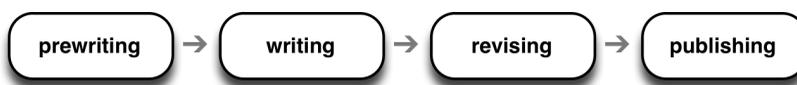
Defining the characteristics of the product of "good writing" (a challenge in itself, to be sure) omits consideration of the process used to create it. Composition courses are tasked with teaching students the methods of composition—methods that have not been clearly identified yet by research (Fulkerson, 2005). The distinction between process and product can unfortunately be viewed as an unresolvable dichotomy in which an instructor must teach the process but grade the product, creating a disconnect between method and assessment that can frustrate or stymie students. Ultimately, students are expected to produce essays, themes, theses, or dissertations as tangible evidence of something that cannot be made physical: human thought. Most significantly, this mismatch means composition teachers have no guarantee students actually implement the processes teachers are teaching. Even without attempting direct

observation of the writing process as it happens, simply determining what the writing process is can lead to a surprising level of uncertainty.

Writing is traditionally conceptualized as a linear process (Figure 1), with distinct steps leading inexorably from start to finish (Clark, 2003), roughly based on the classical canons of rhetoric (Crowley, 1977). As Nancy Sommers wrote in *College Communication and Composition*, "the process represented in the linear model is based on the irreversibility of speech. . . . What is impossible in speech is revision" (1980, p. 324). A fundamental distinction exists between the orality of classic rhetoric and the literacy of modern composition (Ong, 1988): one of the traditional steps in the writing process is possible only when the communication takes written form, even though the linear model is presented with a design appropriate for oratory delivery. We cannot simply apply the classic process of orality to the written word without making adjustments due to the new abilities presented by written language. Speech necessarily proceeds chronologically; if a change needs to be made to the spoken word, it can only be made additively (Barthes qtd. in Sommers, 1980). Writing, however, can be subjected to alterations (including deletions) at any time; thus, the traditional linear model does not accommodate the non-chronological nature of writing (Perl, 1979). Additionally, that linear writing model employs a self-referential structure: one of the steps of writing is writing itself. In other words, this model does little to clarify the nature of writing or help illustrate how best to teach writing.

Sommers argues that our entire conceptualization of the writing process must change to accommodate the writer's ability to revise (1980). By evaluating case studies, she illus-

Figure 1. The classic linear writing-process model (adapted from Clark, 2003, p. 8)



trates significant differences between novice and experienced writers strictly in terms of how thoroughly they revise their writing before considering it finished. Despite the publication of her work thirty years ago, the classic linear model persists as the instructional foundation in primary and secondary education. If teachers of composition courses are to teach the process of writing, teachers need a way to demonstrate, observe, and give feedback on the processes being taught. Those processes cannot be assessed if the only things teachers grade are finalized drafts. Within online courses, teachers have an opportunity to observe the writing process. Student composition happens almost exclusively on the computer; teachers of online courses often score essays on the computer; online courses are mediated through a computer. As the common tool in each of these components, the computer should be able to provide valuable information about how student writing is done. Google's Wave platform had provided just such an ability.

Publicly introduced on 28 May 2009, Google Wave was a communications technology that combined familiar elements of email, instant messaging, wikis, and discussion boards into one tool that supported collaborative document production (Rasmussen & Hannon, 2009). Waves (which contained a flow of changing information more than a traditional static document) were content stored on a server that invited users could edit, comment on, and add material and features to at will. Waves reflected edits in real time on the computers of all users actively viewing the Wave, so multiple simultaneous edits could take place with all users working with the same up-to-date content. This functionality was later adapted to the current functionality of Google Docs. Additional innovations from Wave further enhanced the Docs platform. Users can attach threaded comments to any point in a document, so discussion can take place beside the relevant content. Comment threads in Google Wave combined real-time, instant messaging style conversations with asynchronous comments, resembling the discussion boards currently ubiquitous in online courses. Conversations

in Wave were visually integrated as part of the content, attached to the source material, rather than being spatially isolated. Additional content, such as photos, YouTube videos, Google Maps, yes/no/maybe voting tools, or surveys/questionnaires were available to embed within a Wave to provide a richer experience that was not solely text-based. From that simple, mostly familiar foundation grew a complex system that allowed rich document creation, editing, and review that, perhaps most importantly, could happen in real-time from multiple users. Real-time simultaneous editing of documents has been ported to the Google Docs platform, as well. The ability to edit simultaneously in real-time means students can perform live peer reviews of works in progress and watch as their peers make revisions or leave comments for future consideration, rather than waiting for a draft to be "complete enough" to submit for review. In a classroom environment, this allows students to consider all documents works-in-progress and subject to continued improvement.

Teachers use peer review to support the revision process of students by providing additional feedback, ostensibly during the composition process. But for the student-author, peer review establishes an earlier deadline for paper completion so another student can review it. Students often feel a paper is complete when they submit it for peer review; revisions are often surface-level thereafter (Wallace & Hayes, 1991). Students see peer review as finished paper, while teachers view it as a chance to see writing mid-process. However, seeing the actual writing process at work is difficult for teachers because the work of writing is done outside the classroom. With computer-mediated collaboration, this separation between completed and in-progress draft can be reduced. Students simply need a tool that allows peers to work together as equal participants while writing. Students are familiar with working together on one another's material because the act of producing by reworking existing material is quite common in our society, even if rare in our education system. Many students experience collaborative creation outside the classroom walls.

Collaboration through Production: Producer-Participants

In *Free Culture* (2004), Lawrence Lessig suggests two essential components for effective education: students should 1) learn to “express themselves” and 2) learn ways of “constructing meaning” (p. 44–45). He provides a short example of inner-city students who are given tools for expression (video cameras, in this case) and the challenge of creating a product (here, a short film) to discuss the influence of gun violence on their lives. The students took up the project like nothing else the school offered. The reason, Lessig argued, was not because students found the subject matter interesting (though they likely did) or because computers were involved in the video production (though they likely were). Instead, he says, the students were engaged because they could work with meaningful material: they could remix the video clips, audio files, and any other available source material. To Lessig, the flexibility to re-use relevant material to create something new developed a genuine sense of buy-in for the process and a passion for the product. Students were given starting material and a goal and were allowed to do what they did best: manipulate material to suit their needs, a process Lessig terms “RW culture” because it encourages people to add their own creative styles and abilities to given materials—to rewrite existing content. In Lessig’s example the students were no longer simply passive absorbers of information from texts or teachers. They also were not working on isolated tasks, separated from the context of their materials. Instead, they functioned as a hybrid: a producer-participant.

When students are given tools for creation, content for manipulation, and a relevant idea for study, they become involved participants in a growing discussion of a topic of concern; additionally, they become users of the material and tools they are given, ultimately empowering them to be producers of their own contributions of viewpoints. Indeed, creativity based on outside influences has a history of being valued

in our society. Referring again to his notion of “RW culture,” Lessig explains:

From the very beginning of human culture, we have taught our kids RW creativity. We have taught them, that is, how to build upon the culture around us by making reference to that culture or criticizing it. ... We have encouraged them to build upon it. (Lessig, 2008, p. 106)

Students expect to be able to rework previously created material and to work together to create solutions to their current problems. Technology has made the tools available; indeed, many students already have the requisite skills to achieve the goals. Proper training is needed to develop students’ abilities to use those skills well (Lessig, 2008). Or, as Henry Jenkins says, “We need to rethink the goals of... education so that young people can come to think of themselves as cultural producers and participants and not simply as consumers, critical or otherwise” (2006, p. 270).

But how can technology facilitate such collaboration and allow students, particularly in composition, to rewrite existing material? Students in face-to-face composition classes are already accustomed to a limited example of this process through peer-review exercises. Online classes lack the immediacy and simultaneity of face-to-face meetings, making peer review of an actual draft more challenging to coordinate. Most of today’s courses taught through the computer do not yet harness technology in ways that facilitate networked authorship or a transparent composition process. Making a draft-in-progress available to multiple students would provide “hands-on” experimentation with the writing process in a collaborative environment. Instead, distance learners are generally given a writing prompt, perhaps provided a rubric, and told to submit a completed draft. The hard work and experimentation of writing is to be done by a lone student without interaction or advice. The equivalent act in science education would be to ask a biology student to dissect a frog at home, with neither group nor oversight, and report

on the findings when finished. Composition classes present strikingly similar problem: the “experimentation” in a course focused on composition is the process of composing; thus, the “hands-on” act of writing should be performed collaboratively, rather than in isolation. The unstated assumption for most composition courses is that writers work in isolation, in contrast to the RW culture familiar to students.

Bringing the Process Online

Even though cooperative learning is an important goal of instruction, cooperation and teamwork often elude teachers of online courses. The literature of the past decade is replete with complaints that the online environment does not lend itself to interactive learning (Paulus, 2005; McMillan, 2002). Removed from the interactive classroom environment, the online composition student often writes in isolation. Online courses typically limit student interaction to discussion-board posts, which are a far cry from peer editing of essay drafts. When composition courses are held online, the separation between instruction and process becomes amplified. What if students could work with one another while creating an essay, rather than simply at arbitrary “draft” stages? If essay composition and online course involvement both occur on the computer, we can re-conceive “peer revision” as a process to occur alongside the drafting process. If other students could view a work-in-progress, they could make suggestions for improvement, correction, or even future direction long before the author makes the writing complete enough to be printed. Collaborative learning theory has taken many forms over the years, but in composition courses the practice of collaborative learning is often limited simply to peer-review editing. While pure revision is certainly an effective means of improving student writing, it also relies more on a student’s finished product than on the writing process itself.

Online Learning and Interactivity

In recent years, both academic literature and popular culture have exploded with discussions and valuations of the social nature of today’s online media. The last few years have brought with them a new understanding of the nature of online interactions, one that has not been successfully adopted by the education community. Teachers and program evaluators are drawn to the promise of new features: If Web 2.0 has reshaped commerce and communication online, why not implement it in the service of online learning? But an excitement over the development of Web 2.0 is insufficient to ensure the promotion of genuine learning in the classroom; the tools used must position the student, rather than the technology, in the forefront. As technologies continue to advance, we see online course environments continue to gain features, and virtual learning continues to gain popularity and support from administrations and policymakers. Virtual classes are touted as a more-convenient alternative to existing face-to-face courses, but the convenience may come at the expense of academic rigor. Comparisons between live and virtual courses often show how the features of an online course can reproduce or replace functionality taken for granted in a face-to-face environment. Rather than leveraging the capabilities of technology to provide new approaches to learning, online courses are often evaluated in terms of their ability to reproduce the methods of traditional courses.

When considering the application of new-media technologies to education, the conversation eventually turns toward conversations about the Internet as a focal point of technological developments for creating and sharing ideas with others. The World Wide Web has indeed facilitated unprecedented communication, but it does not automatically meet the need for genuine interaction and meaningful engagement that students need. A common complaint of

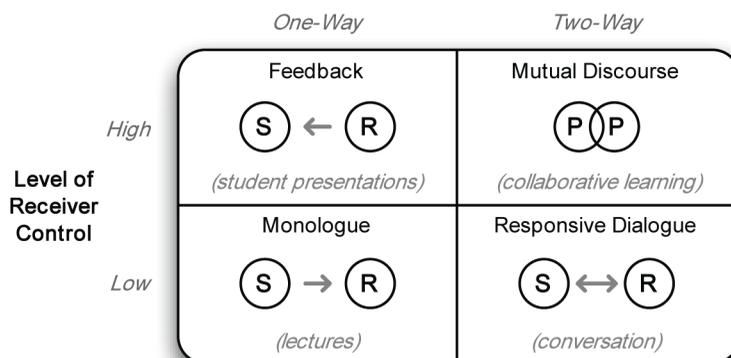
teachers working online is a lack of interaction with their students. A common emphasis of product marketing for web-based learning tools is their interactivity. Why, then, is there tension and dissatisfaction with online learning? The difference between interaction and interactivity is greater than it would appear.

In “A Four-Part Model of Cyber-Interactivity: Some Cyber-Places Are More Interactive Than Others”, Sally J. McMillan presents a two-factor model of computer-mediated cyber-interactivity (see Figure 2) that focuses on the primary direction of communication and the level of control held by the user (2002). Within this framework, “interactivity” can include something as simple as hovertext displaying when a user moves the mouse over an image—no click is even necessary. On the other hand, true “interaction” requires two-way communication where the user is integrated as part of a discussion and feels a degree of control over the content and presentation of a particular interaction, much like a simple face-to-face conversation where each participant has the freedom to alter the trajectory of the dialog at any point. McMillan recognizes this

familiar standard of effective communication and characterizes it by the high level of user control and two-way idea exchange inherent in the process, naming the scenario a “mutual discourse” wherein each participant can influence, enhance, and contribute to the conversation. This shared, simultaneous exchange of ideas and control of the interaction contrasts with a “responsive dialogue” that involves two-way communication but little control over pace or direction by the user.

Effective collaboration requires the mutual discourse of equal participants so that all parties involved in the production of a product can contribute meaningfully. In the composition classroom, mutual discourse would be achieved only when few reviewers have an equal ability to determine the outcome of a paper. Most systems limit the involvement of peer reviewers to simply making comments on a printed draft without being able to directly affect the final text. An obvious comparison here is with face-to-face conversation, in which there is a tremendous degree of interplay among participants. The content, in the form of ideas or even the words chosen to express them, is created

Figure 2. McMillan’s model of cyber-interactivity. Note: S = sender, R = receiver, P = participant (sender/receiver roles are interchangeable). (Adapted from McMillan, 2002, p. 276; parenthetical comments added).



by the participants; feedback is provided in real time, and control of the conversation is handed off among the participants as the conversation progresses. This key combination of creation, feedback, and control are of course available through real-time communications technologies like video chats and, to a degree, instant messaging; the only trouble with those methods is the requirement of the simultaneous presence of all participants. The use of asynchronous communications, such as e-mail, can often restrict the two-way discourse that tends to accompany immediacy in live conversations. An e-mail is sent; the sender then waits for a reply. This, again, is responsive dialogue: the user is involved and engaged, but there is a clear separation between the sender and the receiver of information, and that information is traveling in only one direction at any given time. Two participants on equal footing collaborating as a team toward mutual production of a shared product is a far more difficult goal to attain through technology, as live, face-to-face interaction seems essential.

Social-networking sites, such as Twitter, Facebook and YouTube, are providing platforms for asynchronous conversations that are more flexible than e-mail or instant messaging in a very fundamental way: the conversation exists in one place (a web page), added to by anyone. While at face value, the discussion-posting process is similar to the commenting features discussed previously, a significant detail sets these conversations apart from those appearing the bottom of a blog page. With a blog, the user is a visitor to a site maintained by someone else. The actual page, the focus of attention and draw for visitors, is created by a separate entity; the visitor is able to provide little more than commentary on someone else's content. With social media, visitors can both comment and create, effectively learning to be an active member of the discussion, a producer-participant. Instead of being limited to commenting on someone else's work, users are provided the opportunity to add to the material being discussed. Users can create their own text, photos, or video and post them to a social-media site, thereby adding to the content

of the site and providing material for further discussion. Today's students are learning to be active members of collaborative partnerships outside the confines of our education system. John Seely Brown and Paul DuGuid (2002, pp. 128–29) distinguish between “learning about” a concept—as is very common in our education system—versus “learning to be” an active and effective user of information, emphasizing the importance of human interaction in the information processing and management. An effort to incorporate collaborative writing into a composition course should rely on students' pre-existing understanding of how to be a member of a discussion community and allow students to apply those skills to their writing tasks.

Google Wave combined the abilities of commenting and creating into the process of collaborative document production, allowing users to both manipulate content and discuss content—much like reviewing and revising writing—in a single online interface. In this kind of context, students are made to feel as though they have control over the content of the page; they are free to add their own opinions, ideas, counter-arguments, and commentary to the work of others. Students can therefore cross the divide between “learning about” the topic of an essay and “learning to be” an interactive member of the conversation developing through the comment discussions and revisions. Because users have the ability to comment as well as edit, students can ask questions of one another or make suggestions for changes before officially committing them to the document. Feedback could be provided the same way: instructors could view the content, contribute to any discussions taking place, and add comments or suggestions to any point in a document. Through the interface, teachers could join an existing practical conversation about student writing. By using the same tools as the students, the teacher's comments no longer hold the final say in all discussions, and conversations are no longer one-way (like McMillan's feedback or monologue; see Figure 2). Mutual discourse encourages students to view themselves as equal peers and to critically consider feedback

from every contributor. Allowing the teacher to be a peer in a collaborative environment shifts the responsibility for quality control and empowers students to hold greater sway in the process (King, 1993). With collaborative document creation, revision no longer needs to be seen as a step that is chronologically separated from drafting; the two processes would coexist simultaneously. Students would see the benefit of peer review as it was happening, rather than having to wait for back-and-forth communication that might not seem immediately relevant.

With multiple simultaneous or asynchronous editors on the same document, understanding what has changed and holding participants accountable for their contributions could potentially become overwhelming. However, since all users of a Wave had to be signed in before accessing the content, the Wave servers tracked what comments and changes that were made by what users, recording every action taken to create the document. The “playback” feature in Google Wave allowed users to see all changes made to a document step-by-step, in the same order in which the changes were made. Students who miss a group (or class) meeting could quite literally replay the events that led the document to reach its new state. Users began playback by pressing a button with a familiar “play” arrow to be taken to the beginning of the document’s history—in most cases, back to an empty Wave. From there, a toolbar containing familiar buttons controlled movement backward/forward or to the beginning/end of the Wave’s development, and a slider allowed movement to any point in that history. Using this interface, a peer or evaluating instructor could watch the formation of the document step by step, including identification of which user was responsible for each change. This feature protected the wave’s content from a vindictive student erasing a group’s work by highlighting the document contents and pressing the delete key. In other systems, the work would be lost, and the perpetrator might go unidentified. However, with the playback feature, not only could the work be recovered, but any user was

able to see the identity of the user responsible for each change. Similarly, when a teacher reviewed the progress of Wave construction, the contributions of each student were easy to determine, making meaningful, individual evaluative feedback far more accurate and far easier to provide. This level of flexibility and accountability would be beneficial for both face-to-face and distance education. Students in any location, in any situation, and at any time could enjoy the same benefits of interaction with the content and with other editor-creators.

Focusing on the Student

If interaction exists between two people, and successful interaction in modern web design relies on the content of users, then online education systems have a troubling challenge: to foreground the student who is not part of the development process, rather than the technology around which the course is built. Marketing for content-management systems highlights features of the systems. However, little attention is paid to whether students must learn more in order to use the new system or whether students instead use the system in order to learn more about the curriculum. Whereas the field of instructional design seems focused on creating systems with excessive (or unacceptably limited) functionality, the field of interface design provides a practical and beneficial adjusted focus: the end-user. In the classroom, the end-user is the student, and the goals of effective system design and instructional technology should be the benefit of the student, not necessarily the commercial viability of the system itself. In *User-Centered Technology: A Rhetorical Theory for Computers and Other Mundane Artifacts*, Robert R. Johnson (1998) explores the way people interact with interfaces and comments on the need for users to effectively learn how to use a system. In so doing, he expresses a viewpoint about learning that is reminiscent of the hands-on learning discussed above. Johnson understands that useful learning must have practice at its core:

We learn as we do within the context of know-how and use; the actions beget the learning. The reversal of theory then practice to practice then theory is a table-turning phenomenon unrecognizable by many academic disciplines that instead champion the knowledge of theory over the knowledge of practice (if indeed the knowledge of practice is even recognized in the first place). Such a radical view of knowledge and learning, as that which is derived from practice, is an activity of reinvention of the fundamental material makeup of our very educational systems. (Johnson, 1998, p. 6)

Today's connected students already have the "knowledge of practice"—the web is a constant companion to them. Online courses should take advantage of their existing abilities. In this section, Johnson's User-Centered Design model will be applied to an educational setting as "student-centered design," providing a lens through which I will evaluate collaborative composition tools for online learning.

Johnson's concept of User-Centered Design emphasizes the central role a user must play in the development of any technological system. He illustrates that an "artifact" (a device or a system) necessarily has an interface created by a designer, and that these components are necessarily filtered through the user's situation before ultimately influencing the

user (see Figure 3). To Johnson, the end-user must be at the center of design considerations for any new system. He identifies four ways in which the user influences system design, arguing that the user must be central to all design decisions. The case of interface design is the most familiar: the placement and function of buttons, controls, and displays in both software and hardware must make sense to the intended user. The user's situation determines the circumstances under which the system will be used. The designer's image of what system will do must be conveyed to the user, and the user must possess some understanding of the functions or abilities of the system. In slightly more practical terms, if a new tool is presented to a user, that user should understand what the tool does, what the goal behind the tool is (the designer's image), the situations in which the tool should be used, and the functions of the tool's interface. When these four components are created with the user in mind, use of the system will seem far more natural to the user, and the user is more likely to understand when and how best to use the system.

When the user in question is a student, Johnson's model of design must be altered slightly (see Figure 4) due to the community of practice found in an educational system. The "artifact" is usually a text, and the "interface" is almost always defined by students' educational

Figure 3. Johnson's user-centered design model (Adapted from Johnson, 1998, p. 30.)

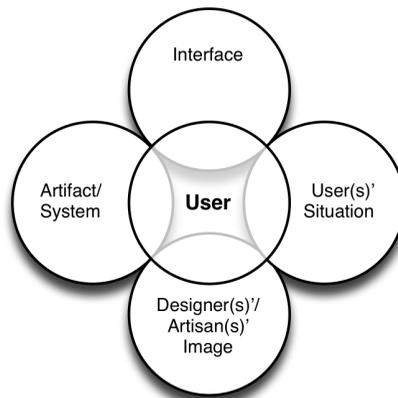
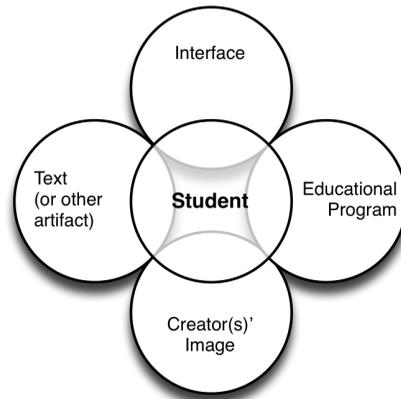


Figure 4. My adaptation for education. Note: “Creator(s)” can be textbook publishers, teachers, peers, etc.; a “Text” can be a book (or digital equivalent thereof), website, wiki, blog, etc.

An Adaptation: Student-Centered Design



programs; students rarely interact with a text under other circumstances. Therefore, when a student is the user, the model must be changed to highlight how the content or interface creator, the text, and the educational program affect the student. The Student-Centered Design model emphasizes that the student is at the heart of an array of interactions, many of which are technological. Course designers must ensure that student interaction emphasizes collaboration and remains as the focus of course design, rather than focusing on the technology itself. In the case of collaborative composition, the elements of this model become quite specific. The artifact being manipulated is ultimately the student’s writing, made to fit the image of both the student-author and the teacher who initially assigned the work (and will ultimately evaluate the outcome). When students review the work of their peers, peer reviewers also contribute an image of what the text should accomplish. This scenario of distributed authorship exists within the context of an educational program or curriculum, and the text produced must meet the requirements of that program. But what of the interface? In the traditional classroom,

the interface is different for every participant. Student-authors engage with the text on a computer, but teachers and peer reviewers interact via a printed version. An effective and student-centered system for collaborative composition would provide a unified interface through which all parties could interact with the text.

In this way, the Student-Centered Design model suggests the creation of customized systems in a classroom. If the aim of the classroom is to prepare students for the “real world,” the systems used in the classroom should be the same tools that students will be using in the field. (What teacher expects students to use a customized word processor to write a school paper? Microsoft Word has become the de facto standard in business and, as a result, the classroom.) Therefore, technology used in the classroom need not be developed specifically for students; rather, the students should be taught to use technology that best enables them to learn the skills they need and the content of their curriculum. On a more practical level, classrooms serve not to showcase applications but rather to educate students. From this perspective, a design model may not be the most appropriate way to

evaluate an approach to classroom technology, though a student-centered focus does inform the way a classroom works. Students should not operate in isolation (Bandura, 1971; Curtis & Lawson, 2001; Hawkins, 1980; Hirumi & Bermúdez, 1996), students should work collaboratively with their peers. Students also expect technology to provide an interactive experience in which they can manipulate the materials they are asked to learn. The technology therefore becomes only a facilitating component in a vast education infrastructure designed to support the growth and development of students (Grabill, 2007).

A SPECIFIC SOLUTION: GOOGLE'S WAVE PLATFORM

I have shown that online courses must be designed around students, who must be working collaboratively, and who should be emphasizing revision in their composition classes. Thus far, virtual composition instruction is missing the mark, and the blame seems to be placed on the limitations of the technologies used. However, recent advances in technology provide teachers in online composition courses an opportunity that is unavailable in face-to-face classrooms. Because composition occurs almost exclusively on computers, educators and researchers should be able to observe the composition process as it happens. For a teacher to watch how a student composes, the teacher should not need to wait for the creation of an official draft. Instead, teachers and students' peers should be able to engage the writer at any stage in the process. Collaboration should be possible even for works in progress. Composition classes could then focus on the task of revision as an essay is written, making the student-created material the centerpiece of instruction. With students and their peers functioning as equal participants in the composition process, McMillan's goal of mutual discourse would be achieved—students would collaboratively create written documents. Technology allowing true collaborative document creation would meet the needs

of composition classes and course designers. So long as an online tool accommodates the complete revision process—including multiple simultaneous users, commenting, and revisions—online composition would be collaborative. In contrast, the familiar reviewing tools of Microsoft Word (track changes and commenting) facilitate a responsive dialog on McMillan's model of cyber-interactivity, not the desired mutual discourse. A collaborative composition tool must more robustly support the revision process.

Google Wave presented a novel approach to collaborative document creation. With this technology, the Wave was hosted on a server, and all participants access the Wave through their web browsers. Document storage and file sharing was not an issue, since Waves were stored in the cloud. Software was not an issue; the system was supported by most modern standards-complaint browsers and requires no proprietary software to run, as all major functionality was built on HTML5 specifications. One of Google Wave's most noteworthy features was its ability to simultaneously and transparently facilitate both synchronous (live, real-time) and asynchronous (delayed, back-and-forth) communication styles. While multiple users are viewing the same Wave, edits made by one user appear instantly on the screens of other users. Wave users can also hold back-and-forth conversations that are even more instant than most instant-messaging systems currently provide: users can see what other users are typing as they type, character by character (and, consequently, typo by typo—Google Wave allowed no secrets but did provide spell-check (see Figure 5). If multiple users chose to edit the same content simultaneously, all changes appeared on all users' screens exactly as the changes were being made (see Figure 6). However, if a user only views a Wave on occasion, all changes that had been made since the previous visit were highlighted to draw attention to the updated content (see Figure 7). Notes or comments could be made at any point in the document (see Figure 8), placing a discussion at the relevant

Figure 5. Automatic spell check

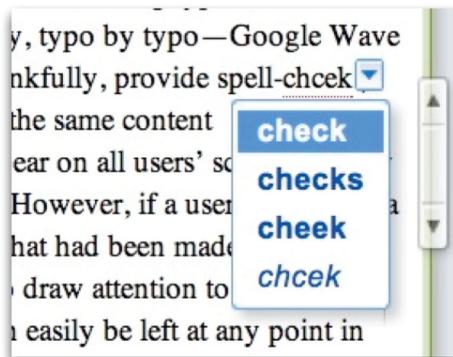
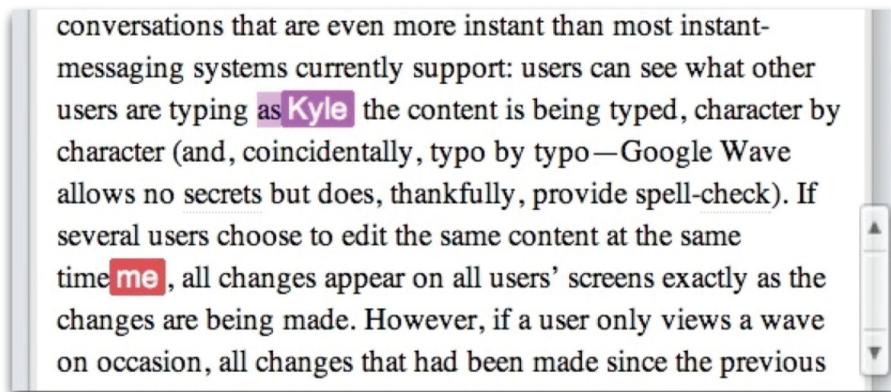


Figure 6. Multiple users simultaneously editing a document



point in the text. The flow of the document then contained both the content and its associated discussion in one stream. This simple function allowed collaborative document creation in a manner that wasn't previously possible and has only partially been implemented in tools like Google Docs: students had access to distributed, optionally synchronous, open-access collaboration with inline discussions. Students in a computer lab could work simultaneously on the same document, either composing different sections or even reviewing and revising each other's work as it was created. For example, if a student had been typing content and a peer noticed a typo, the peer could have fixed the typo before the first student finished typing the sentence (see Figure 6).

Google Wave held the potential to facilitate the writing processes for students in ways that align with the need for interaction in education. Writing done in Google Wave was able to be edited, annotated, and discussed by multiple participants, forming a mutual discourse in which contributors worked together equally to create a shared product. Conversations about the text were attached to the material being produced, allowing collaborative digestion of the information. By allowing a document to be the focal point of conversation and collaboration, Google Wave highlighted the discussion (and the people involved) as peripheral to the actual text and kept student-created content as the centerpiece. Existing writing assignments could have migrated into Google Wave to

Figure 7. Previous changes

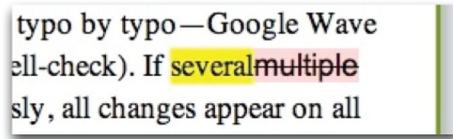
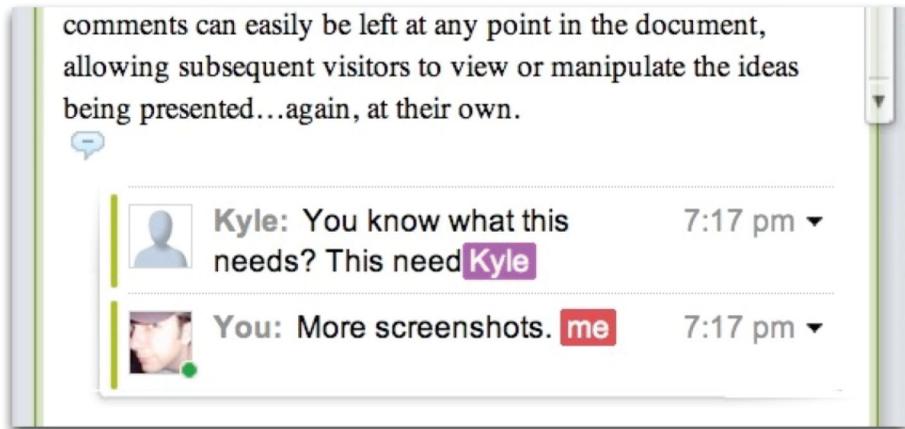


Figure 8. Simultaneous typing in live conversations



add new levels of collaboration in the writing process. Instead of starting with an outline on paper, converting the outline to paragraph form, then sharing the completed draft with a peer as typically happens in writing courses today, students could have gone to a computer lab, created a new Wave for their paper, and began with a rough outline. Peers and the teacher could have checked the organization of ideas before the draft was expanded, providing feedback, suggestions, or even changes as they saw fit. Then, as the student wrote the draft, those same collaborators could have continued their interactions, watching the paragraphs form and the ideas develop. Instead of waiting until an entire draft had been created before getting feedback, the student-author would have had a constant flow of feedback throughout the writing process.

Working with living documents constantly in a state of flux means students would not need to think of “the writing process” as a sequence of

discrete steps but instead could see the process of organizing, exploring, and expanding ideas as a continuous evolution of a text, rather than a process that progresses through predictable, chronological phases. Revision is an integral and expected component of writing, and a wave highlights the importance of revision by allowing it to be seen as it happens. Waves can clearly show changes made to a document over time, thus encouraging students to view revision as an essential component of writing and allowing educators unprecedented access to the writing process for assessment or research purposes. Current composition studies are limited to viewing the rough and final drafts of student work and relying on inference to determine the approach taken to revision. By studying student work on the Wave platform, researchers could evaluate the process itself and see how changes were made, rather than being limited to seeing only what was changed.

CONCLUSION: REVISION-BASED INTERACTION IN ONLINE COMPOSITION EDUCATION

Giving students the ability to not only comment on but also directly manipulate the contents of a document allows for shared responsibility of creation and development. As McMillan suggests with mutual discourse, students would be co-participants (or co-authors), rather than writer and peer (or author and reviewer). Collaborative efforts on writing would consist of shared partnerships working together, rather than the back-and-forth conversation that is currently the norm. Within the context of collaborative composition, the difference between true interaction and the simple interactivity of an application interface is easy to distinguish. Effective interaction is needed for the social production of writing, which is becoming increasingly common in our ever more-connected society. The benefits of collaborative learning have been evident in the literature for years; social production of writing would set aside the traditional image of an isolated author in favor of a more appropriate and accurate image of writing teams.

True collaboration provides student agency: student groups are responsible for entire composition process, not just draft review. Presently, composition students are accustomed to a production process of isolated work to create a draft, a pause in development to get a peer review of the draft, then a resumption of work to implement and integrate the suggested changes. This is analogous to McMillan's responsive dialog: information is exchanged, but there is no true collaboration due to the uneven balance of control. With appropriate technology, students could engage in true mutual discourse, in which they work together as equal partners striving toward the shared goal of composition. Their work could be collaborative throughout the composition process, rather than only during brief exchanges when that process is paused arbitrarily for peer review. Thus, the lines

between writer and writers' peers would blur as a result of the true collaboration of mutual discourse.

Using social document production would take advantage of the collective-processing skills that students develop through modern media (Jenkins, 2006). Allowing students to use their existing skills for composition would make the process seem less foreign and less intimidating. With communication technologies reducing the influence of distance on collaboration, online composition should also benefit from those advances. Moving the composition process to an online forum could help students develop a better sense of an international writing community. Given the benefits of online collaborative composition and the needs of educators, composition courses, and instructional design, we must implement technologies providing collaborative composition that emphasizes revision. We also must realize and emphasize the advantages of online composition over the limitations of face-to-face revision practices. Even live courses would benefit if students had the ability to work collaboratively on their writing.

We must find solutions to our instructional needs that meet the objectives of collaborative interaction through revision. Google Wave had provided a solution to the need for collaborative composition in online courses, and it provided a better view of students' revision processes than can be found in traditional face-to-face courses. This technology had the potential to improve online composition education and better inform composition researchers. Unfortunately, Google discontinued its Wave platform as of April 2012. However, many of the technologies used to create Wave have been released as an open-source package, maintained by Apache and delivered as a "Wave in a box," making it possible to create a locally hosted operational Wave system with just a few commands on a server. Schools can host Wave servers locally, ensuring the privacy of student content. Local hosting of the technology allows schools to respond to local technological needs. How-

ever, a successful educational solution has to be usable and practical, not just technical in nature. The limited public support of Google Wave suggests that, rather than focusing on a particular product, educational improvements should focus on the abilities provided by modern technologies, as well as the opportunities afforded by those abilities.

Collaborative writing is essential in a modern composition course. The same technology that students use to compose their essays for class can also help instructors and researchers observe and improve the writing process. By implementing the use of wave in existing composition courses, both online and in person, teachers would benefit from the social collaboration skills students bring to the classroom, researchers could gain a better understanding of the process involved in peer revision, and students would develop a greater sense of the importance of revision in the composition process. Creating documents collaboratively using systems such as Google Wave can facilitate student learning about composition and better prepare them for the digital collaboration they are likely to experience in the workplace.

REFERENCES

- Bandura, A. (1971). *Social learning theory*. Morristown, NJ: General Learning Press.
- Barbour, M. K. (2008). Secondary students' perceptions of web-based learning. *Quarterly Review of Distance Education, 9*(4), 357–371.
- Berkenkotter, C., & Murray, D. M. (1983). Decisions and revisions: The planning strategies of a publishing writer, and Response of a laboratory rat: Or, being protocolled. *College Composition and Communication, 34*(2), 156–172. doi:10.2307/357403.
- Brown, J. S., & Duguid, P. (2002). *The social life of information*. Boston, MA: Harvard Business School Press.
- Clark, I. L. (2003). Process. In *Concepts in composition: Theory and practice in the teaching of writing* (pp. 1–29). Mahwah, NJ: Lawrence Erlbaum.
- Crowley, S. (1977). Components of the composing process. *College Composition and Communication, 28*(2), 166–169. doi:10.2307/356106.
- Curtis, D. D., & Lawson, M. J. (2001). Exploring collaborative online learning. *Journal of Asynchronous Learning Networks, 5*(1). Retrieved October 3, 2010, from <http://directory.wikieducator.org>
- Emig, J. (1971). *The composing processes of twelfth graders*. NCTE Research Report. Urbana, IL: NCTE.
- Ferris, D. R. (1997). The influence of teacher commentary on student revision. *TESOL Quarterly, 31*(2), 315–339. doi:10.2307/3588049.
- Flower, L., & Hayes, J. R. (1981). A cognitive process theory of writing. *College Composition and Communication, 32*(4), 365–387. doi:10.2307/356600.
- Fulkerson, R. (2005). Composition at the turn of the twenty-first century. *College Composition and Communication, 56*(4), 654–687.
- Gillet, D., Latchman, H., Salzmann, C., & Crisalle, O. (2001). Hands-on laboratory experiments in flexible and distance learning. *Journal of Engineering Education, 90*(2), 187–191. doi:10.1002/j.2168-9830.2001.tb00589.x.
- Grabill, J. T. (2007). *Writing community change: Designing technologies for citizen action*. New York, NY: Hampton Press.
- Haaga, D. A. F. (1993). Peer review of term papers in graduate psychology courses. *Teaching of Psychology, 20*(1), 28–32. doi:10.1207/s15328023top2001_5.
- Hall, G. E. (2010). Technology's Achilles heel: Achieving high-quality implementation. *Journal of Research on Technology in Education, 42*(3), 231–263.
- Hawkins, T. (1980). Intimacy and audience: The relationship between revision and the social dimension of peer tutoring. *College English, 42*(1), 64–68. doi:10.2307/376037.
- Hirumi, A., & Bermúdez, A. (1996). Interactivity, distance education, and instructional systems design converge on the information superhighway. *Journal of Research on Computing in Education, 29*(1), 1–16.
- Horowitz, D. (1986). Process, not product: Less than meets the eye. *TESOL Quarterly, 20*(1), 141–144. doi:10.2307/3586397.

- Ioannou, A., & Hannafin, R. (2000). Deficiencies of course management systems: Do students care? *Quarterly Review of Distance Education*, 9(4), 415–425.
- Jahng, N., Nielsen, W. S., & Chan, E. K. H. (2010). Collaborative learning in an online course: A comparison of communication patterns in small and whole group activities. *Journal of Distance Education*, 24(2), 39–58.
- Jenkins, H. (2006). *Convergence culture: Where old and new media collide*. New York, NY: NYU Press.
- Johnson, R. R. (1998). *User-centered technology: A rhetorical theory for computers and other mundane artifacts*. Albany, NY: SUNY Press.
- King, A. (1993). From sage on the stage to guide on the side. *College Teaching*, 41(1), 30–35. doi:10.1080/87567555.1993.9926781.
- Klemm, W. R. (2005). Use and mis-use of technology for online, asynchronous, collaborative learning. In T. Roberts (Ed.), *Computer-supported collaborative learning in higher education*. Hershey, PA: IGI Global.
- Lessig, L. (2004). *Free culture: How big media uses technology and the law to lock down culture and control creativity*. New York, NY: Penguin Press.
- Lessig, L. (2008). *Remix: Making art and commerce thrive in the hybrid economy*. New York, NY: Penguin Press. doi:10.5040/9781849662505.
- McGroarty, M. E., & Zhu, W. (1997). Triangulation in classroom research: A study of peer revision. *Language Learning*, 47(1), 1–43. doi:10.1111/0023-8333.11997001.
- McMillan, S. J. (2002). A four-part model of cyber-interactivity: Some cyber-places are more interactive than others. *New Media & Society*, 4(2), 271–291.
- Ong, W. J. (1988). *Orality and literacy: The technologizing of the word*. London, UK: Burns & Oates.
- Ovadia, S. (2010). The viability of Google Wave as an online collaboration tool. *Behavioral & Social Sciences Librarian*, 29(2), 4. doi:10.1080/01639261003742256.
- Paulus, T. M. (1999). The effect of peer and teacher feedback on student writing. *Journal of Second Language Writing*, 8(3), 265–289. doi:10.1016/S1060-3743(99)80117-9.
- Paulus, T. M. (2005). Collaboration or cooperation? Analyzing small group interactions in educational environments. In *Computer-supported collaborative learning in higher education* (pp. 100–124). Hershey, PA: IGI Global.
- Perl, S. (1979). The composing processes of unskilled college writers. *Research in the Teaching of English*, 13(4), 317–336.
- Rasmussen, L., & Hannon, S. (2009). *Google Wave developer preview at Google I/O 2009*. Retrieved May 28, 2009, from <http://youtube.com>
- Rose, M. (1980). Rigid rules, inflexible plans, and the stifling of language: A cognitivist analysis of writer's block. *College Composition and Communication*, 31(4), 389–401. doi:10.2307/356589.
- Sommers, N. (1980). Revision strategies of student writers and experienced adult writers. *College Composition and Communication*, 31(4), 378–388. doi:10.2307/356588.
- Stoddard, B., & MacArthur, C. A. (1993). A peer editor strategy: Guiding learning-disabled students in response and revision. *Research in the Teaching of English*, 27(1), 76–103.
- Topping, K. (1998). Peer assessment between students in colleges and universities. *Review of Educational Research*, 68(3), 249–276. doi:10.3102/00346543068003249.
- Trevisanus, J. (2009). You say tomato, I say tomato, let's not call the whole thing off: The challenge of user experience design in distributed learning environments. *Horizon*, 17(3), 208–217. doi:10.1108/10748120910993231.
- Wallace, D. L., & Hayes, J. R. (1991). Redefining revision for freshmen. *Research in the Teaching of English*, 25(1), 54–66.
- Yagelski, R. P. (1995). The role of classroom context in the revision strategies of student writers. *Research in the Teaching of English*, 29(2), 216–238.