Collaboration or Cooperation? Analyzing Group Dynamics and Revision Processes in Wikis

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ABSTRACT:

This study examines the online writing and revision behaviors of university language learners. In small groups, 53 intermediate German students from three classes at three different universities created wiki pages with background information about a novel read in class. All meaning- and language-related revisions were analyzed to determine whether students revised only their own contributions (cooperation) or took responsibility for the text as a whole (collaboration). Results indicate that students utilized both collaborative and cooperative strategies to make formal revisions, but they worked more cooperatively when making content changes. Group members did not take on any specific task roles with regards to formal revisions, but they were engaged in the project to varying degrees. While most students contributed to content and editing of their wiki page as required, some students did not do their share of the work and engaged in social loafing and free riding. The study demonstrates wikis' great potential for collaborative and autonomous work, but it also underlines the need for clear tasks, teacher guidance and possibly even intervention. Suggestions to mitigate social loafing and free riding in group work are discussed.

KEYWORDS

Wikis, Collaborative Writing, Revisions, Task Roles

INTRODUCTION

In its relatively short but eventful history, what we know today as the Internet has developed from a limited system of linked universities to a vast public network connecting billions of people across the globe. Recently, we have witnessed yet another fundamental transformation of the World Wide Web: Web 2.0 is a second generation of web development and design that facilitates communication, secure information sharing, interoperability, and collaboration (see "Web 2.0"). With new applications such as social-networking sites, wikis, and (micro) blogs, the new Internet no longer just links information but instead connects people (Warschauer, 2009).

The popularity of this new generation of tools has permeated many areas of life, including teaching. Often referred to as 'Education 2.0' or 'Classroom 2.0', this approach attempts to harness the power of many Web 2.0 socialization and communication tools to promote learning (Sturm, Kennell, McBride & Kelly, 2009). In fact, two recent volumes highlight

pedagogical approaches and research that use a variety of these tools for language instruction (Lomicka & Lord, 2009; Thomas, 2009).

Crook (2008) defines four key dimensions of Education 2.0: collaboration, publication, literacy, and inquiry. Of particular relevance to this article are the first two dimensions. By supporting communication among learners, Web 2.0 tools can encourage varying degrees of collaboration. In addition, the "read-and-write character" of the new Internet (Crook, 2008, p. 9) provides opportunities for authentic publication. Focusing on collaborative online publication, two major dimensions of Education 2.0, the present study investigates how language (L2) learners work together on a wiki.

Wikis in Education

Using special software, a wiki is a website that allows all users to easily edit its content, organization, and design. Instead of limiting such privileges to the so-called webmaster, wikis such as Wikipedia are created and maintained by a whole community. This collaborative, maybe even democratic process blurs the traditional roles of reader, writer, and editor and promotes writing as a social act that occurs with and for other people (Sturm et al., 2009).

Wikis have made their way into classrooms, where they "can challenge the practice of single authorship and help overcome the spatial and temporal hurdles to productive collaborative writing" (Lundin, 2008, p. 438). Using wikis in education has been suggested to promote autonomous learning (Kessler, 2009; Kessler & Bikowski, 2010), encourage learners to depend on one another (Lund, 2008), and increase motivation since students are producing texts for an audience (Ajjan & Hartshorne, 2008; Mak & Coniam, 2008). While one common form of L2 collaborative writing is peer review, which can promote analytic and writing skills (Ferris, 2003; Nystrand & Brandt, 1989), wikis allow groups of learners to pool their knowledge and contributions during the entire composition process, from the initial drafting through later stages such as group editing and peer review (Ajjan & Hartshorne, 2008; Bradley, Lindstrom & Rystedt, 2010; Gibbons, 2010; Larusson & Altermann, 2009; Tharp, 2010). As reported by Storch (2005), this type of joint writing can have a positive impact on the text's quality, not only in terms of grammatical accuracy but also task fulfillment and complexity. Since several learners are working together on one task, the resulting texts can be more accurate, informational, and varied (Karasavvidis, 2010; Sykes, Oskoz & Thorne, 2008).

A growing body of publications describes educational implementations of wikis. Hughes and Narayan (2009), for example, describe two different projects. In a multimedia design course, a wiki was used to produce a glossary of key terms, and the students in an education course developed a wiki as an assignment archive. O'Shea, Baker, Allen, Curry-Corcoran, and Allen (2007) used a wiki in yet another way, namely to have students write the actual textbook for a course. In an education methods course, students employed a wiki to store and edit work from their research and as a forum for discussion (Wheeler, Yeomans & Wheeler, 2008). Not surprisingly, wikis are also being developed for L2 language instruction, where they can serve as a platform for translation work (Miyazoe & Anderson, 2010), the production of a brochure for parents (Mak & Coniam, 2008), project-based learning (Evans, n.d.), culture learning (Kessler, 2009; Lund, 2008), or developing writing skills (Arnold, Ducate & Kost, 2009; Elola & Oskoz, 2010; Lee, 2010). What all these wiki projects have in common is the underlying objective "to realize and enact a more fully social view of writing in which each text is, plainly and literally, connected to and developed by a number of people" (Lundin, 2008, p. 445).

Collaborative Learning

Rooted in constructivism, group projects like those described above have become a staple of the student-centered classroom. Learning is viewed as a dialogic process where learners

pool their knowledge and experience to create new meanings (Palincsar, 1998). But how exactly do groups go about completing a joint task? To describe this process, researchers often distinguish between cooperation and collaboration (Dillenbourg, Baker, Blaye & O'Malley, 1996; Haythornthwaite, 2006). Cooperation allows for some independent work of group members, who take responsibility for specific sub-tasks to be assembled into a larger whole at the end. Collaboration, in contrast, does not include such task specialization, and instead requires synchronous work of all members on a variety of aspects of the project. Based on these definitions, we operationalized the two approaches to reflect the specific task the groups were working on, a joint online composition task, and used the editing be-havior as the main indicator of collaboration vs. cooperation:

- Cooperation: Learners divide the work and focus their revisions mostly on their own contributions to the text.
- Collaboration: Learners take responsibility for the text as a whole and edit their own as well as their group mates' contributions.

It seems then that collaboration has greater potential to improve the end product's quality, whereas the division of labor in cooperation might provide for speedier, more convenient task completion.

However, as Cecez-Kecmanovic and Webb (2000) pointed out, "learning through a collabo-rative process cannot be forced upon or induced through outside forces: it has to be inter-nally created, mutually accepted as valid and valuable, and enacted by students" (section 2, para. 4). Educators can create conditions that are conducive to collaboration or cooperation, but how groups tackle the task is ultimately beyond the instructor's control.

The Wiki Composition Process

There are few studies that have specifically investigated the wiki composition process. Vié-gas, Wattenberg, and Dave (2004) studied the evolution of several Wikipedia pages, some of which did not stabilize for a while and instead went through significant periods of growth and shrinkage as content was added and removed. While they observed so-called edit wars on some pages (i.e., extended back and forth between versions), a more common pattern was the first mover advantage, meaning that content added early on tended to undergo few modifications. Viégas and her colleagues hypothesized that the original creator of the page set its tone, which was often respected by other contributors. Educational wikis, however, are fundamentally different because of their smaller, less anonymous community with dif-ferent motivations and we cannot assume that findings for Wikipedia necessarily transfer to educational wikis.

Hughes and Narayan (2009) investigated two different types of educational wikis and found that in one of the classes, 17% of students reported never editing or even reviewing their classmates' contributions to the wiki. Comparing the two courses, they found that 25% and 14% in the respective groups of students believed that their contributions remained un-changed while 42% and 43% thought their writing had been edited by others. The re-searchers concluded that "these results do not strongly indicate that collaborative knowl-edge construction was occurring in both groups" (p. 68). Mak and Coniam (2008) also reported some hesitation from their L2 wiki authors. In the beginning of the composition process, students mostly added new content to the page and it was not until later on that they began to feel comfortable enough to edit each other's work. Lee (2010) also found that students in an elementary Spanish course were less likely to edit each other's work because they were not confident in their own Spanish ability. They did, however, report that the wiki helped them to create a higher quality end product than if they had been working alone. They enjoyed being able to use the discussion board and history pages to discuss the orga-nization of the page and scaffold error correction. In addition to the students' reports, Lee discovered that the task type in the different wiki assignments contributed greatly to the amount of revisions and length of the texts. Kessler's (2009) findings for L2 wiki composi-

tion were rather different. Interestingly, the students in his study engaged in much more peer- than self-editing. These two types of editing behavior also focused on different aspects of the writing: while self-editing behavior focused on formatting and other non-language aspects, form-focused edits occurred mostly during peer-editing. Kessler did not observe any reservations towards editing the work of other learners: "In fact, they demonstrated more willingness to edit their peers' writing than their own." (p. 88). Kessler and Bikowski (2010) analyzed an educational wiki, in which only a small group of students was involved in the initial writing and brainstorming phase and included large-scale deletions. After two weeks of "build and destroy" (Kessler & Bikowski, 2010, p. 48), students seemed more comfortable and engaged in broader collaboration. Interestingly, many ideas contributed during the first phase survived and were included in the final version but not in their original wording. In that sense, Kessler and Bikowski observed a first mover advantage for ideas and content, similar to the phenomenon described by Viégas et al. (2004). It appears that Kessler's (2009) and Kessler and Bikowski's (2010) L2 learners did engage in collaboration whereas Hughes and Narayan's (2009), Mak and Coniam's (2008), and Lee's (2010) findings point towards cooperation, at least in the case of a considerable number of participants or at the beginning of the writing process.

Group Roles

Another aspect of the inner workings of a group is the roles its members perform. Roles are "sets of behaviors that are characteristic of persons in a particular social context (Forsyth, 1999, p. 124) and "form part of our self-definition within the group, our sense of who we are" (Brown, 2000, p. 72). As such, roles imply a certain division of labor among group members (Brown, 2000). Even when there are no formal roles assigned within a group, informal roles do tend to emerge over time as members perform specific actions or functions (Forsyth, 1999). Benne and Sheates (1948; quoted in Hare, 2003) distinguished between task, group building/maintenance and individual roles. While task roles, like initiator, focus on the goal/task at hand, harmonizer and other group building/maintenance roles (also referred to as socio-emotional roles) support the interpersonal workings of the group. In contrast, individual roles (e.g., aggressor, playboy) do not promote the group's interest but are instead focused on the individual's needs. Roles are very common in collaboration and cooperation. In fact, roles, such as leader, newcomer, and scapegoat can be found in most groups (Levine & Moreland, 1990), a phenomenon that has also been observed for groups working on a wiki. Analyzing groups of graduate students working on a class wiki, Arnold, Ducate, Lomicka, and Lord (2009) found that informal group leaders emerged early on and, depending on the group, used varying strategies to ensure the successful completion of the assignment. As these studies illustrate, roles are an important component of a group dynamic and, for this reason, will be examined in the current study.

As mentioned above, the present study investigates how L2 learners worked together on a wiki. Besides collaborative vs. cooperative editing behavior, it analyzes group members' task roles during the composition process. For the purpose of this study, we define roles in terms of writing and editing behavior. While learners were not assigned any formal roles for the wiki project, we hypothesized that they might develop unique task roles by focusing their attention on specific aspects of the composition process, guided by either their self-perceived strengths or interests.

METHODS

Research Questions

This project is a follow-up to a previous study on collaborative writing in a wiki (Arnold et al., 2009), which compared two different approaches and investigated their effect on students' revision behavior. It uses the same data from a group (Class 1) that followed an unstructured approach (no teacher feedback until the end of the project) and a second group

(Classes 2+3) that used a teacher-guided process writing approach and also involved several layers of peer and teacher feedback. It was found that both groups made similar amounts of changes to their pages (35.25 revisions per 100 words) and the most common type of edit between the two classes was meaning-changing additions (changes to the content of the page) followed by formal revisions (changes to the grammar, spelling, or punctuation on the page). The more structured class made significantly more formal revisions than the less structured class and these revisions were also significantly more accurate than the other class, likely because they received feedback throughout their project and had longer to work on the project.

While several interesting questions regarding revision processes were answered in this previous study, other questions pertaining to collaboration were raised. For example, it seemed that some students focused merely on their own sections when revising, while others revised the entire page regardless of who had written the text. If students tend to focus only on their own sections without editing or even reading sections contributed by their group members, the task remains more cooperative than collaborative. It also appeared that some students chose to revise specific aspects of the wiki, such as content or form, presumably based on what they perceived as their strengths in L2 writing. Based on these informal observations made during data analysis for the previous study, we decided to reanalyze the data to further investigate the process of collaboration in this wiki environment. The research questions in the current study seek to determine how students worked together to compose the wiki:

1. Did students complete the task in a cooperative manner or a truly collaborative manner? In other words, when students made changes to the wiki, did they change only their own writing (cooperation) or that of other group members as well (collaboration)?
2. Were formal revisions more successful when students edited their own contributions or those of others?
3. While working on their wiki, did students develop unique task roles?

Procedures

Three intermediate German classes with a total of 53 students from three large North American universities took part in this study. The first class (Class 1) was a fourth-semester German language class at a large public university in Western Canada consisting of 26 students, most of whom were taking the class to fulfill their language requirement. One student decided not to post anything on the wiki, so the data of Class 1 are based on 25 students. The second (n=10) and third (n=18) classes (Classes 2+3) were both fifth-semester German composition and conversation classes at different large public universities in the Southeastern United States. Most of the students in these classes were enrolled in German for either major or minor credit. Although Classes 2+3 were fifth-semester classes and Class 1 a fourth-semester class, students in all three courses had received about 150 contact hours of instruction prior to the semester in which the study was conducted. The focus in each of the three classes was on interpretive, interpersonal, and presentational skills and students completed other formal writing assignments in addition to the wiki assignment.

For each of the classes, the wiki assignment was based on a graded reader of the German novel *Am kürzeren Ende der Sonnenallee* by Thomas Brussig (2003) and in Class 1, involved viewing the movie *Sonnenallee* (1998), on which the novel was based. Set in East Berlin in the German Democratic Republic during the 1970's, the novel frequently references cultural and historical events during that time. In order to fully comprehend the novel, readers need background information about these various events and references. Since a wiki can be collaboratively assembled and maintained, it was deemed the most appropriate tool for students to research these topics, pool their knowledge, and share it with the entire class.

The wiki assignment was completed slightly differently in Class 1 and Classes 2+3. In Class 1, students completed the wiki project after they had read the novel and watched the movie. The 25 students were divided into groups of 2-3 and had three weeks to design a wiki page consisting of at least 400 words about one of nine cultural or historical topics provided by the instructor as well as include references to the novel and movie (see Appendix A for a list of topics). At the end of the three weeks, students introduced their pages in a presentation for the class. Students did not receive feedback on their pages until after their presentations.

In Classes 2+3, the task was more structured. Twenty-eight students were divided into groups of 2-4 to research one of 10 cultural or historical topics. Students from both universities contributed to one wiki site to increase the pool of information, however only students from the same university worked together on the same topic. Since the purpose of their wiki site was to provide information about these historical and cultural references while they were reading the text, students completed the site in six weeks prior to reading the novel. The first step of the task was for students to complete and post an annotated bibliography. After receiving feedback from their instructor, they posted an outline for their page. Next, they wrote a first draft, received feedback from their instructor and peers at each university, then a second draft, and received feedback, and eventually a final draft. After each step, students received a different grading rubric that was tailored to the task. Before reading the novel, so that students would be exposed to each of the topics, they completed a web quest based on the wiki encouraging them to visit each page to learn about the historical/cultural reference. While reading the novel, students and instructors used the wiki site as a reference where they could look up information about the various topics referred to in the text.

Data Collection and Analysis

One useful feature of wikis, especially to researchers, is the history page that saves every edit made to the page. It was our main data source for the analysis of individual students' edits. At the end of the semester, a questionnaire was administered to capture learner experiences and attitudes. We draw on select questionnaire data for a broader discussion of our findings. (See Arnold et al., 2009, for more information about the survey findings.)

To analyze the wiki pages, the text was first divided into t-units—"one main clause plus whatever subordinate clauses happen to be attached or embedded within" (Hunt as cited in Crookes, 1990, p. 184). When analyzing formal revisions, such as grammar or spelling, a single word was the unit of analysis. Next, all revisions were coded according to Arnold et al.'s (2009) taxonomy of revisions, which is based on Faigley and Witte's (1981) widely used taxonomy (e.g., Connor and Asenavage, 1994; Dix, 2006; Min, 2006; New, 1999; Paulus, 1999; Phinney and Khouri, 1993; van Gelderen, 1997; Yasuda, 2004) and incorporates features from Dix (2006) and Jones (2008) to tailor it to online writing. The taxonomy provides for coding both surface changes, such as formal revisions to grammar, spelling, and punctuation, as well as meaning changes, which can be micro or macro in nature. Each formal revision was also coded as successful or unsuccessful, depending on whether the resulting form was error-free or not. Table 1 outlines the categories of this taxonomy with examples of surface and meaning changes taken from our data. The two researchers coding the wiki data reached an interrater reliability of 98% for the t-unit segmentation and 86% for the revision categories.

Table 1
Taxonomy of Revision Types for this Study (Arnold et al., 2009)

Formal changes (surface)	
Format	Adding, deleting, fixing, or moving of an image, link, and heading
Spelling	"Be**r**schwerde" → "Beschwerde" (revision successful); "mude" → "m**e**ude" (revision unsuccessful)
Punctuation	"Ziemlich viele Leute denken dass, der Eiserne Vorhang..." → "Ziemlich viele Leute denken, dass der Eiserne Vorhang..." (revision successful)
Verbs	"weil der Krieg endete**t**" → "weil der Krieg endete" (revision successful); "viele Leute **hat** gestorben" → "viele Leute **haben** gestorben" (revision unsuccessful)
Nominal/ Adjectival Endings	"Der Eiserne Vorhang war ein interessant Situation..." → "Der Eiserne Vorhang war ein**e** interessant**e** Situation..." (revision successful); "Der Eiserne Vorhang ist eine Referenz für **den** Grenze..." → "Der Eiserne Vorhang ist eine Referenz für **der** Grenze..." (revision unsuccessful)
Word Order	"Der Osten hat vorgetäuscht, dass keine Mauer **gibt es**." → "Der Osten hat vorgetäuscht, dass **es** keine Mauer **gibt**." (revision successful); "Die Briten haben nicht **wieder** für ihn gestimmt." → "Die Briten haben nicht für ihn **wieder** gestimmt." (revision unsuccessful)
Lexical Revisions	"Churchill hatte der größten Verdacht Stalin." → "Churchill hatte der größten Verdacht **von** Stalin." (revision unsuccessful); "Hätten wir die Bomben **tropfen** sollen?" → "Hätten wir die Bomben **abwerfen** sollen?" (revision successful)
Translation	"Das Geld der Kirche kam von **Donation**." → "Das Geld der Kirche kam von **Spenden**."
Meaning-preserving changes (stylistic)	
Additions	"Am erste Dezember 1998 hob das GDR (ost Deutschland) Parlament, der Satz, in die GDR Einrichtung welches die SED Gewalt gab auf." → Am ersten Dezember 1998 hob das DDR Parlament den Satz, **der gesagt hatte** (1 ADDITION), das die SED Gewalt aufgab, in die GDR Einrichtung."
Deletions	"Jugendweihe bevor den DDR war eine populäre Feier für **die** Jugendlich," → "Jugendweihe vor die DDR war eine populäre Feier für Jugendlichen," (*die* deleted)
Substitutions	"weil Religion **ist weider eine wichtige Sache zu haben**, aber die Jugendweihe bleibt für viel." → "weil Religion, **wieder wichtig ist**, aber die Jugendweihe bleibt für viel."
Reordering	A word or phrase moved from one part of the text to another
Meaning-developing changes	
Significant Content Additions	"Truman hatte auch Verdacht für Stalin, und suchte eine Weise, vor die Sowjetunion nahm dem Krieg gegen Japan teil, dem Krieg zu enden." (3 ADDITIONS)
Cont. Deletions	Similar to significant additions, but section is deleted from wiki
Factual Correction	"Hause waren von 1971 bis **1919** gegrundet." → "Hause waren von 1971 bis **1990** gegrundet."

After coding all of the revisions, each revision was matched to its corresponding author and tracked backwards through all archived versions of each wiki page in order to assess whose text students had edited (their own or the text of their group members). When all revisions had been matched, the data were analyzed to determine if students took on specific roles when editing.

RESULTS

Research Question 1: When students made changes to the wiki, did they change their own writing or that of other group members?

The analysis showed that the wiki composition process was a combination of collaborative and cooperative writing. Table 2 below shows that seventy-five percent of all students made revisions to their own as well as to other writers' text, which indicates that the majority of students took a collaborative approach to group work. Almost two thirds of all revisions (64%), however, were executed in the students' own writing, meaning that the majority of revisions were based in cooperation rather than collaboration.

While this trend held true across revision types, the distribution among revision categories differed considerably. Of the formal revisions, 51% of revisions were made to the author's own text (formal revisions to others' text: 49%). Even more so in meaning-preserving and meaning-developing revisions, students made the vast majority of changes, 72%, to their own writing (meaning-based revisions to others' text: 28%).

Table 2
Categorization of All Edits

	Formal Edits				Content Edits		Total
	In Author's Own Text		In Others' Text		In Author's Own Text	In Others' Text	
	Successful	Unsuccessful	Successful	Unsuccessful			
Class 1	134 (7%)	31 (2%)	297 (15%)	69 (4%)	888 (46%)	498 (26%)	1917
Classes 2 +3	518 (24%)	107 (5%)	287 (13%)	120 (6%)	937 (43%)	203 (9%)	2172
Total	652 (16%)	138 (3%)	584 (14%)	189 (5%)	1825 (45%)	701 (17%)	4089

Interestingly, there were some notable differences between Class 1 and Classes 2+3. While Class 1 made more (69%) formal revisions to the contributions of others, the students in Classes 2+3 mostly revised for form on their own writing (61%). Both Class 1 and Classes 2+3, made most meaning-preserving and meaning-developing revisions to the passages they had originally added themselves but this trend was more pronounced in Classes 2+3 (Class 1: 64%; Classes 2+3: 82%). These numbers indicate that the groups in Class 1 worked more collaboratively in general than those in Classes 2+3.

Research Question 2: Were formal revisions more successful when students edited their own contributions or those of others?

Looking at the quality of the formal revisions students attempted, there was no big effect for the relationship between the original author and the reviser. Table 3 below shows that of all revisions, 42% were successful revisions in the student's own text, compared with a 37% success rate when students revised the contributions of their group mates. Again, there was a pronounced difference between the two classes. Classes 2+3 had a higher success rate when editing their own contributions for form (50%) than text added by others (28%). The

reverse was true for Class 1. They made more successful formal revisions on their group mates' writing (56%) than their own (25%).

Table 3
Categorization of Formal Edits

	Formal Edits				Total
	In Author's Own Text		In Others' Text		
	Successful	Unsuccessful	Successful	Unsuccessful	
Class 1	134 (25%)	31 (6%)	297 (56%)	69 (13%)	531
Classes 2 +3	518 (50%)	107 (10%)	287 (28%)	120 (12%)	1032
Total	652 (42%)	138 (9%)	584 (37%)	189 (12%)	1563

Research Question 3: While working on their wiki, did students develop unique task roles?

After analyzing the types of formal and meaning changes students made to their wikis, there does not seem to be a pattern regarding task roles. We hypothesized that students would self-assign roles regarding corrections. For example, one student might consider herself in charge of formatting changes and another might focus on word order. This did not happen. Instead, the data provided evidence of how engaged (or not) the learners were in the project. There was a wide range of different work loads students assumed, which led to the creation of four work load roles: free rider, social loafer, team player, and leader (refer to Table 4 for details about the work load share for these roles). The percentages indicate the amount of changes students made in their group to their own and others' texts.

Table 4
Definition of Work Load Roles

Role	Work Load		
	Group of Two Students	Group of Three Students	Group of Four Students
Free Rider	<10%	<10%	<10%
Social Loafer	<40%	<25%	<20%
Team Player	40-60%	25-35%	20-30%
Leader	>60%	>40%	>30%

The terms 'free rider' and 'social loafer' are adapted from Piezon and Donaldson's (2005) description of types of group members. Free riders, as the name suggests, did almost nothing to contribute to the completion of the project and let their group members carry the burden of the work. Social loafers contributed something, but less than their fair share. To capture the full range of degrees of engagement, we added two labels: 'team player' and 'leader'. Team players completed their fair share relative to how many group members there were, while leaders did more than was expected.

Each student received two labels, one for their meaning revisions and the other for their formal changes. For example, if a student completed less than 10% of the changes in the formal category, s/he would be coded as a free rider in the category of formal revisions, but if s/he completed 50% of the changes in meaning, s/he would be categorized as a team player in a two-person group in the category of meaning. As illustrated in Table 5 below, some students were leaders in the category of formal or meaning revision, other group

members shared everything more or less equally, and some students did little in either category.

Table 5
Frequency of Work Load Roles

	Leader		Team Player		Social Loafer		Free Rider	
	formal	meaning	formal	meaning	formal	meaning	formal	meaning
Class 1 (n=25)	8	8	5	6	8	7	4	4
Classes 2+3 (n=28)	8	8	8	8	7	10	5	2
Total	16	16	13	14	15	17	9	6

When comparing the number of students in each category, the roles seem to be fairly evenly distributed, except for the fewer free riders (see Table 5). There is also not much of a difference between the classes. A similar number of students took on the roles of leader, team player, and social loafer in the formal and meaning categories. There were, however, less than half as many free riders in the meaning category compared to all other categories. This demonstrates that most students did at least more than 10% of the work to write their wikis, but not everyone contributed fairly to the formal edits. In some groups, the leader changed between categories — one student was a leader for formal edits and another student took the lead on the meaning edits — while in other groups, one student led in both categories or all the students worked together on both parts. In five of the nineteen groups, students worked in pairs and these groups did not have any free riders. Of the remaining fourteen groups, another five had no free riders, while the other nine groups had at least one student who acted as a free rider on either formal changes or meaning.

DISCUSSION

The first research question addressed the issue of collaboration vs. cooperation. In terms of meaning-related revisions, students clearly used a more cooperative approach when making changes to content (72% in own, 28% in others' text). This primary focus of an editor on the content of his/her own text might indicate a hesitancy to change another writer's contribution in terms of content and has already been observed in other wiki studies (Arnold et al., 2009; Lee, 2010; Lund, 2008; Lund & Smørdal, 2006; Mak & Coniam, 2008; Wheeler et al., 2008). This potential reluctance could be due to the psychological ownership of a text. Blau and Caspi (2009) reported that peer edits were perceived as intrusive and lowered an author's sense of psychological ownership.

The pattern observed here is very different from the initial 'build and destroy' phase that Kessler and Bikowski (2010) observed, but supports Viégas et al.'s (2004) notion of the first-mover advantage: content that was added to a page early on tended to stay and was rarely changed. In an educational context like the one described here, this behavior is likely due to students' experiences at school and university, where individual work forms the basis for most—if not all—writing assignments. Only long-term changes in instructional practices which advocate collective processes over individual, sometimes competitive, learning can cause a transformation of these deeply engrained patterns and lead to more collaborative behavior.

In contrast, our analysis revealed that formal revisions were very balanced between making changes in an author's own text (51%) and in another student's text (49%). This could be interpreted to indicate that students felt less inhibited to correct the formal mistakes of their group mates while they considered meaning-based revisions more problematic, maybe even

off limits. On the other hand, this behavior could also be rooted in the students' L2 educational experiences, where L2 writing assignments are mainly (seen as) a way to assess mastery of the linguistic code as opposed to a communicative act.

These findings differ, on the one hand, from Kessler's (2009) study, in which he found that students engaged to a much larger extent in peer editing than self-editing when formal revisions were concerned. Kessler's students seemed to be working more collaboratively in terms of form-focused revisions than the students in the current study. On the other hand, Hughes and Narayan (2009) report that their students engaged in less collaborative efforts, and Mak and Coniam (2008) found that their students were reluctant to peer-edit formal mistakes, thus also displaying more of a cooperative work pattern. The students in the present study seem to occupy a middle ground between collaboration and cooperation.

Interestingly, when considering the groups in the current analysis separately, we see a slightly altered picture which seems to support both of the different trends displayed in the previously discussed studies. Class 1 made more formal revisions to other students' texts (69%), whereas Classes 2+3 made more formal revisions to their own texts (61%). Class 1 could be considered to have worked more collaboratively towards creating an error free wiki page. Following Kessler's (2009) analysis, one possible reason for this divergent behavior can be found in the task design of the wiki project (Class 1: unstructured, summative feedback; Classes 2+3: structured, formative feedback). The different approaches render the work for Class 1 very similar to Kessler's design where students also worked in a more autonomous environment and engaged more in peer-edits than self-edits. Perhaps organized feedback from peers and teachers, while having positive effects, such as higher frequency and more successful formal revisions (Arnold et al., 2009), also leads learners to focus more on their own writing for formal revisions. They feel personally addressed by the feedback and, hence, more responsible for their own part than when working in an autonomous environment, which might lead to more collaborative behavior.

Another reason for the divergent pattern might be students' personal preferences regarding the wiki project and the perception of their group work as evidenced by their comments on a questionnaire that was administered at the end of the semester. Students in Class 1 were, overall, a little more positive in their post-assignment evaluation than Classes 2+3. The great majority of the students in Class 1 commented on how well their groups worked together and that they enjoyed the wiki project. Students in Classes 2+3 had more mixed reactions towards their experience: while some students liked the wiki and considered group work as beneficial, a larger number of students made negative comments about group work in general. Since the criticism was not tied to any specific details of the assignment (topic, number of drafts required, amounts of feedback received), we can conclude that the different reactions and the observed differences in collaboration (more in Class 1) versus cooperation (more in Classes 2+3) might also be due to group dynamics and working style preferences of the students who participated in this study.[1]

With regard to the second research question, investigating the success rate of students' formal revisions, the current study found that students were generally as successful editing others' work (37%) as their own (42%). This overall trend, however, did not hold true when analyzing the two groups separately. While students in Class 1 produced more error-free forms when editing the contributions of their group mates (56%) than when editing their own work (25%), the opposite was true for Classes 2+3. They achieved 28% of successful revisions when editing their group's texts, but 50% when revising their own contributions. This seemingly reverse pattern is largely due to the work of only one member of Class 1 whose changes represent 40% of all revisions done in the entire class and hence skewed the overall result. If this student's editing contributions are excluded from analysis, revisions in Class 1 present a far more balanced picture: 37% success rate in editing their own texts and 39% successful edits in others' work. Even results between the study's two groups

can also be found when comparing the unsuccessful formal revisions: Class 1 had 6% and Classes 2+3 had 10% unsuccessful edits in their own work, and 13% (Class 1) and 12% (Classes 2+3) unsuccessful revisions in other's texts. Without the student in Class 1 whose editing behavior skewed the distribution, we observe a balance in revision behavior across groups. The slightly greater success rate in editing formal changes on their own work of Classes 2+3 (50%) vs. Class 1 (37%) can probably be attributed to the instructional approach in these classes which emphasized accuracy more clearly through assigning several drafts over a longer period of time and providing several rounds of feedback. Those students who received feedback might have felt more personally responsible for their own text and put more effort into making it error free than into revising their group members' texts, the same explanation for why they seemed to work more cooperatively than collaboratively.

The third research question explored the roles students adopted in their groups. An analysis of the number of revisions students performed displayed a wide range of workload roles, ranging from free riders, who contributed only minimally to the wiki or not at all, to leaders, who worked on it extensively. While the distributed nature of wikis can function as an affordance by allowing group members to work in a space and time independent manner, this also creates a certain degree of distance and anonymity, which allows people to fade into the background more easily without contributing their share to the project. Investigating only meaning-related changes on a wiki, Kessler and Bikowski (2010) reported a large number of students with limited participation. Fifty-five percent of students edited the content of the wiki only once and only a small group of students claimed ownership. Each of these 22 students accounted for only 1% of the content-based work on the wiki and would be labeled free riders using the present study's categories. In contrast, the category of free rider formed the smallest group for meaning-based changes in the present study: Only 11% of participants were labeled free riders because they did less than 10% of the group's content work. The difference in free riders reported here and by Kessler and Bikowski (2010) can be attributed to group size. While between two and four students worked together for the project discussed here, the wiki analyzed by Kessler and Bikowski (2010) was composed of 40 students. It seems that smaller groups create more equal contribution patterns, which is also supported by our finding that there were no free riders in dyads.

In terms of task roles, the analysis revealed that students did not focus their language-related revisions on particular formal aspects (e.g., spelling, verb conjugation). We had hypothesized that students might self-select such task roles based on their self-perceived strengths in the target language. This self-selection requires a high degree of self-awareness, which the students in this study might not have displayed due to their limited proficiency or a lack of self-assessment of their abilities.

However, some interesting patterns evolved with regard to students' level of engagement in the project. There were 12 students who clearly showed a low level of engagement in the task because they were categorized as either free riders (FR) or social loafers (SL) in terms of both meaning and formal revisions (FR-FR; FR-SL; SL-FR; SL-SL). The same cannot be said of the 16 students who received the label of free rider in one category and team player or leader in the other, which constitutes a combination of two non-adjacent labels. Rather, it appears that they played to their own strengths by choosing to put more effort into a category that they felt they could accomplish well and less work into the other category that they perceived as a weakness. For example, a student might have thought: "I'm not very good at grammar so I'll put more work into content to make up for it."

Likewise, students might have consciously decreased their efforts in one category after having contributed more than their share (leader) to the other category, thinking that their group members should compensate the other category with their own contributions. Students whose editing profile combined two non-adjacent categories of work load roles actually did develop specific task roles, albeit not in the originally predicted manner of concen-

trating on specific language features for revision, but instead by focusing their efforts on either the formal or the meaning category in their entirety.

The different levels of engagement can be attributed to variations in task motivation. As comments from the students' questionnaires indicate, there were intrinsic as well as extrinsic factors at play. Intrinsic factors were associated with the students' personal opinions about the project and their personal learning experience. Comments about the project spanned the entire continuum from "It was such a great project and great topic. I loved it." to "Don't do it again, it's a headache nobody wants." Personal enjoyment also factored in within the area of intrinsic motivation, as, for example, in "I enjoyed learning about the topic I researched." Extrinsic factors related to issues of group work or workload also came up. Comments about group work extended from negative perceptions like "My partner was not caring and not doing his work." to positive remarks, such as "People contributed different skills" and "more fun atmosphere for doing work". The question of workload also elicited a range of opinions, from "Difficult to do at the end of the year — everybody has different stuff going on." to "The workload was easier. Most of the time I could count on my group to do their work."

PEDAGOGICAL IMPLICATIONS

Based on the findings described above, this study has several pedagogical implications that can help educators with the implementation of collaborative writing projects. While overall results were rather positive as most students contributed considerably to their wiki page in both meaning and formal revisions, there was still a larger number of social loafers and free riders than educators would like to see. In their investigation of psychosocial aspects of on-line student interaction, Piezon and Donaldson (2005) make numerous suggestions to mitigate social loafing and free riding, some of which can be adapted to collaborative projects in L2 class settings. When group members feel that their specific task is a necessary component for the creation of the final product, they experience a sense of personal achievement and are more likely to contribute to the project to the extent required. Increasing task visibility will also help an individual student notice that the instructor is observing his or her efforts. Both of these suggestions can be achieved by assigning roles for specific responsibilities and creating weekly milestones to hold students accountable. Peer evaluations at several points throughout the project would also help to increase task visibility, and demonstrate to group members that their contributions are salient and give underachievers the opportunity to improve their performance. Students must however first be trained how to conduct peer evaluations and be convinced of their importance. Although students in Classes 2+3 in the current study completed peer evaluations on content at several points throughout the project, students noted in the post-survey that they seldom paid attention to their peers and that the teacher's feedback was more important than that of their peers. Just as students are habituated into working individually and sometimes competitively, they tend to view the instructor as the authority whose opinion is the only one that counts. In training students to work collaboratively, assessment must be included so that students appreciate the value of all voices providing feedback, not only that of the teacher who assigns the grades. However, as pointed out by Kessler (2009), some teacher intervention seems to be required to keep students striving for accuracy. In addition to peer evaluations and revisions, task type of the wiki assignment should be considered as a way to keep students engaged in the project. As Lee (2010) found, the task type, including its perceived authenticity, seemed to influence how much students wrote, revised, scaffolded, and collaborated.

Another suggested way to achieve the goal of keeping all students engaged in the project is to practice distributive justice with the students (Piezon & Donaldson, 2005). Distributive justice refers to the fair distribution of rewards among group members. In an instructional setting, rewards usually translate into grades, and one way of achieving distributive justice is through combination grades, i.e., a mixture of group, peer, and individual grades, so that

the instructor is not the sole authority on the project. The class could also develop a rubric together so that everyone's opinion about what is important to the project is included. In addition to distributive justice, cohesive groups are more likely to achieve their goals and less cohesive groups lead to more social loafing. Having students choose their own groups for longer online projects seems to be a better option than grouping them based on skill levels, interests, or other factors. In the study described here, students were grouped based on their topic preference to increase intrinsic motivation for this project. If students self-select their group, as suggested by Piezon and Donaldson (2005), they are likely to work with classmates to whom they feel more accountable, which might be more effective in reducing free ridership. One grouping strategy that was successful in this respect was to form groups of two. Our data show that there were no free riders when students worked only with one partner.

Distributing workload might also have to do with such issues as ownership of the text and self-perceived strengths and weaknesses, which are best addressed explicitly before the start of the project. To ensure a smooth, as well as productive, collaboration process, teachers can encourage students to reflect on how they can contribute to the group and establish a set of expectations for the project. For example, groups benefit from an explicit discussion of important questions such as: (1) Is it acceptable for us to correct each other's grammar mistakes? and (2) Can someone delete or add to a passage s/he did not write? In addition, we as teachers can create a space for dialogue on the built-in wiki discussion board and encourage groups to use this space for brainstorming, planning, and discussion of major revisions before executing them and potentially offending a group member.

CONCLUSION

The present study explored how L2 learners worked together to create a wiki page to provide their classmates with cultural background information about a novel read in class. It also analyzed group members' task roles during the composition process. Results showed that students revised their own as well as their group members' writing with regard to language-related edits, thus working in collaborative as well as cooperative ways, but made a far greater number of content changes to only their own writing. Some differences were observed between the groups, with one class exhibiting slightly more collaborative behavior regarding revisions processes. This can be attributed to personal preferences and group dynamics or to a more autonomous environment that has been shown to lead to more collaborative behavior in other studies (Kessler, 2009). In terms of task roles, students did not self-assign roles regarding specific corrections. Instead, the data illustrated that students were engaged in the project to varying degrees. While most students contributed to the wiki, there were also a number of students not pulling their weight.

The benefits of students working together in a wiki have once more been confirmed by the findings in this study. Most students were able to share the workload, work in a time- and space-independent manner, create an informative page, and they enjoyed the project. Even though there was less teacher intervention compared to group work in a regular class, students still made many revisions and did so rather successfully.

Research on online collaborative writing is still in its infancy and this study points towards several areas that future research might want to pursue. First, it would be interesting to analyze learners' thought and decision-making processes while editing the page. Think aloud protocols and interviews would be helpful in exploring which errors students attempt to revise and which ones they either do not notice or consciously decide to ignore. For language educators and learners alike, it would also be valuable to know how the writing process affects the quality of the end product: Does collaboration result in a more cohesive and linguistically more accurate piece of writing compared to cooperation? Future research could also examine how the structuring of the task changes the process and outcome of the pro-

ject. Instructional design can facilitate or even encourage collaboration but it is ultimately up to the learners to decide how they want to complete a task (Cecez-Kecmanovic & Webb, 2000). This point was confirmed by the present study and stresses the importance of learner training, motivation, and group dynamics. In regard to feedback and collaborative learning, it would also be interesting to examine the effect of explicit training in collaboration (e.g., benefits, procedures, characteristics of effective peer feedback). Since students are often so deeply entrenched in working individually for their own personal grades, educators should try to discover effective ways to break them out of these molds of thinking. Wikis offer many possibilities for conducting this type of collaborative learning and research.

NOTE

1 For more detailed results of the questionnaire see Arnold, Ducate & Kost (2009).

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APPENDIX A

List of Cultural Topics about East Germany

Class 1	Class 2+3
East German Products (e.g., food)	The border
Forbidden Music	Existentialism
Freie Deutsche Jugend Youth Organization	Forbidden music and books
Housing	*Freie Deutsche Jugend* Youth Organization
Religion and the Church	The Iron Curtain
Sandmännchen (TV program for small children)	*Jugendweihe* (secular confirmation)
Staatssicherheit secret police	Potsdam Conference
Traveling	Religion
Working and studying	*Sozialistische Einheitspartei* (political party)
	Staatssicherheit secret police

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