Development of a Synchronous Collaborative Writing Revision Instrument for Teaching English

Jia-Jiunn Lo, Ying-Chieh Wang

Dept. of Information Management
Chung-Hua University
HsinChu, Taiwan, R.O.C.
jlo@chu.edu.tw, m09510033@chu.edu.tw

Shiou-Wen Yeh

Dept. of Applied Linguistics and Language Studies
Chung-Yuan University
ChungLi, Taiwan, R.O.C.
shiouwen@cycu.edu.tw

Abstract—**Collaborative writing, one of the methodological innovations for language teaching, is "the social act of creating a single, coordinate document with two or more participants". Revision is the last process for writing. Corrective feedback and error correction, critical tasks for revision, are important for English as a Second Language/English as a Foreign Language (ESL/EFL) writing instruction. Research findings showed that students' major difficulty in error correction lies in their failure to detect errors. Also, researchers proposed that error analysis can be reinvented in the form of computer-aided error analysis, a new type of computer corpus annotation. Annotations on digital documents can be easily shared among groups of people, making them valuable for a wide variety of tasks, including providing feedback. Collaborative corrective feedback and error correction with asynchronous annotation systems have been developed by researchers. It is suggested that collaborative teams can be enhanced by applying collaboration in a synchronous environment. However, few synchronous annotation systems are developed for corrective feedback and error correction. This study developed a web-based online synchronous collaborative writing revision instrument for collaborative writing revision. With this system, users can collaboratively make corrective feedback and error corrections on digitized documents in a synchronous environment. It is implemented on the general web browser such as Microsoft Internet Explorer, with online annotations in the same way as the traditional paper-based correction approach. Another innovative functionality developed in this system is that the user can freely switch between the *annotation mode* and the *review mode* to neatly review the "right" article after correction without showing the correction marks to reduce the problem of cognitive overload.**

Keywords-online synchronous annotation, collaborative writing, error correction, corrective feedback, computer assisted language learning (CALL), writing instruction

I. INTRODUCTION

Writing to communicate is an essential academic and professional skill, and a university education should help prepare students for the kinds of writing common in the workplace and professional life. However, the teaching of technical writing might encounter some challenges. As explained by [1], "technical writing instruction often operates in isolation from other components of students' communication education". In the globally linked world, collaborating on a computer network is a type of communicative process that can be especially valuable for writers [2]. Therefore, as [3] claimed, students need to feel comfortable in multi-task, multi-user environments and should see the Internet as a valued resource for potential material.

One of the methodological innovations for language teaching is collaborative writing. As defined by [4], collaborative writing is "the social act of creating a single, coordinate document with two or more participants". In collaborative writing, students work together to achieve shared learning goals [5], and language acquisition is facilitated by students interacting in the target language [6]. Collaborative writing also accommodates the principles of social constructivism as proposed by [7]. According to Vygostsky's zone of proximal development, individual learning is mediated through either adult guidance or collaboration with a more capable peer. Moreover, collaborative writing is consistent with communicative language learning and assumption of second language acquisition made by [8], which emphasize that while learning a second language, learners need to actively interact with the external environment, and such a learning environment is worth investigating.

As [3] advocated, one of the most important benefits of collaborative writing is that it makes students aware that writing is a recursive process, allowing them to focus on each phase of the writing process. [2] explained that, the process of writing builds on the action-reaction responses. Through this evolving communicative process, unskilled writers are pushed to achieve higher levels of writing as they learn from others, and skilled writers have the opportunity to exchange ideas and think critically about their writing before a teacher evaluates it. In the situation of collaborative technical writing, "…students demonstrate a tendency toward scaffolding" [2]. That is, each member of the group contributes a particular skill in his or her area of expertise to help complete a task. In this way, students simplify the task and keep one another motivated and in constant pursuit of a goal.

[9] suggested that collaborative teams can be enhanced by applying collaboration in a synchronous environment. A synchronous environment is a real-time communication

environment, wherein team members can meet anywhere at the same time. In the age of information, chat and teleconferencing are considered as "real-time" synchronous environments. Under synchronous environments, learners can participate in one-to-one, one-to-many, or many-many conversations [10]. Synchronous discourse is on a continuum between oral and written discourse of "speak-writing" (Erben, 1999, p. 239 as cited by [10]). It is a popular way to assist online language learning. It can assist learners to visualize the talk process and provide an environment that allows them to ask questions, discuss, interact, and seek assistance from others [10]. Through adequate discussion among users, users can repeat and review their ideas by interact with others so that the addressed concepts can be more understandable [11].

Peer assessment, assessment of students by other students, has many potential benefits to learning for the assessor and the assessee [12]. Moreover, peer assessment can help self-assessment. By assessing the work of others, students gain insight into their own performance. It gives students feedback and opportunities to improve, hence encourages student autonomy and higher order thinking skills. The management of peer assessment can be assisted by Internet technology [13]. As suggested by [14], there are three general issues to consider in using peer assessment: (1) tell students early; (2) give students practice; and (3) include feedback.

Corrective feedback is a technique to help learners correct errors by providing them with some kind of prompting. As defined by [15], corrective feedback takes the form of responses to text or utterances containing an error. It can be facilitative of second language (L2) acquisition [10]. In L2 writing instruction, corrective feedback is a technique to help students correct errors by providing them with some kind of prompting [16]. It is suggested that for learning to take place, learners must struggle with "non-understanding" (Varonis and Gass, 1985 as cited by [10]). Therefore, corrective feedback is an important task for students in many contexts. It is generally agreed that L2 students themselves want and expect feedback on their written errors [17, 18, 19]. However, corrective feedback of students' work is an extremely time consuming task. Considering the time required for correction, the most effective way to correct errors is worth investigating. Researchers have suggested a more constructivist approach to designing open-ended learning environments for corrective feedback. [20] has reminded that online technologies can offer new ways of gathering that information from students. [16] indicated that a crucial variable in corrective feedback is recognizing the existence of errors.

[11] suggested that integrating discussion into annotations can effectively and efficiently improve the learning processes. In fact, traditional corrective feedback and analysis can be reinvented in the form of computer-aided error analysis, which is a new type of computer corpus annotation [21]. Also, [22] proposed that Web-mediated peer assessment can be an alternative to shift students' roles from reviewers to reviewees. During the process, students' interaction can be stimulated and their critical thinking skills

can be fostered. In other words, the limitations of traditional paper-and-pencil error feedback and analysis highlight a new direction. One possible direction is using the online annotation systems for corrective feedback [21, 23]. Such application is grounded in the fast growing fields of distance education and computer learner corpus research.

Annotations are the notes a reader makes to himself/herself, such as students make when reading texts or researchers create when noting references they plan to search [24]. Annotations are a natural way to record comments and ideas in specific contexts within a document. Annotation systems can take advantage of networked technologies to allow communities of readers to comment on the same virtual copy of a text [21]. Compared to paper-based annotations shared merely through printed technology, online annotations provide readers with more opportunities for dialogue and learning through conversations [24]. Annotations on digital documents are easily shared among groups of people, making them valuable for a wide variety of tasks, including providing feedback. As a language learning tool, online annotations for ESL/EFL writing seems to fit with the current trend of distance learning, cognitive conditions for instructed second language acquisition [25].

To this end, this study develops an online synchronous annotation system which can provide annotation marking and knowledge sharing, and can be applied to error correction and error feedback for collaborative writing revision in English writing instruction.

II. SYSTEM ARCHITECTURE

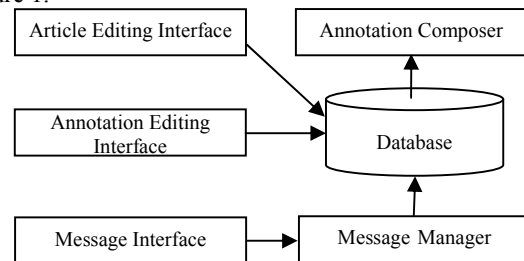The architecture of the proposed system is illustrated in Figure 1.

Figure 1. System Architecture

A. Article Editing Interface

Article editing interface is where students input their articles. As an article is edited, the system will convert it into the HTML format and save it in Database so that it can be displayed with general web page browsers for error correction marking.

B. Annotation Editing Interface

Annotation editing interface (Figure 2), the core component of the system, is where peers input their correction markings of the article. It is implemented on the general web browser such as Microsoft Internet Explorer. In Annotation Editor, peers can make correction marks and comments only, i.e., it is under "read-only" status in that the content of the original document cannot be changed. Such

functionality of making correction marks under "read-only" status is quite important for students to be able to easily compare their original works and the corrective feedback.
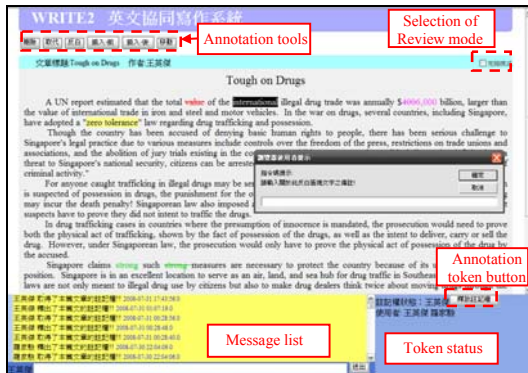

Figure 2.   Illustration of Annotation Editing Interface (with Annotation Token)

Different from previous studies [21, 23], one of the innovative functionalities is the proposed system allows a group peers to collaboratively review and make annotation marks on the same article. To ensure all the peers view the same article version, i.e., concurrent screen display, only one peer is allowed to make annotations at the same time. To create a correction and comment, one first needs to acquire "the annotation token" by clicking the "Annotation token button" (located in the "Status column") to get the annotation right. The Status column shows the one who currently hold the token.

Once got the token, the annotation tools will be shown, the assessor can highlight the text, named *annotation keywords*, to which he/she wants to annotate. Then he/she clicks on one of the annotation tools to activate the corresponding function to place the error correction mark into the annotation keywords. The annotation tools can be shown only on the Annotation editing interface for the one who owns the annotation token. That is, only the one owns the annotation token can make annotations. There are six annotation tools in the system: "Delete", "Replace", "HighLight", "Insert-Before", "Insert-After", and "Move". Then the system uses JavaScript to automatically insert the <SPAN> tag around the annotation keywords for showing the effects of annotation marks and store all related annotation information in Database. For each annotation, a pop-up window is available for entering additional explanations.

If the assessor finishes making annotations, he/she can release the "the annotatioon token" by clicking the "Annotation token button" so that other persons can get the token for further annotation marking. During the processes, for those who do not have the token, if anyone wants to make annotations before the assessor current making annotaions has releasing the token, he/she can send the request for token through synchronous online chat room.

The annotation right control and the concurrent display mechanisms are managed by "Message manager" which will be discussed more detailed later.

As the assessor moves the cursor over the annotation mark, related annotation information will be shown and he/she can delete the correction mark by clicking the "Delete this annotation" button (Figure 3).

Figure 3.   Illustration of annotation information (without Annotation Token)

Anchoring annotation positions is challenging in digital document annotation. The problem of "orphan annotations" is one of the major complains of annotation systems [26]. In this system, since the <SPAN> tags of the annotation marks are inserted around the annotation keywords, the problem of anchoring annotation positions can be avoided even when the document is modified (Figure 4).

(a) original texts and annotation mark

(b) annotation mark after deleting texts

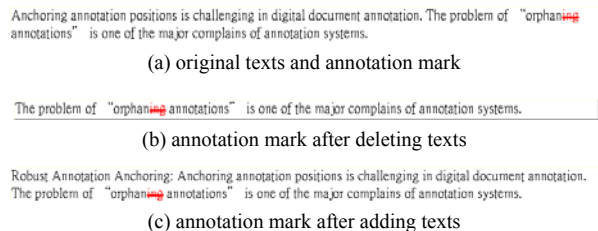(c) annotation mark after adding texts

Figure 4.   Illustration of Robust Annotation Anchoring

C.   Database

Two database modules are included in the system, Article Database and Annotation Database. Article Database stores the articles students written in HTML format through Article editing interface. Annotation Database stores the related information of annotations, such as annotator, annotation type, annotation identification code, annotation keywords, annotation notes, etc.

D.   Annotation Composer

This system uses JavaScript to automatically insert the <SPAN> tag into HTML codes of the original article. Within each <SPAN> tag, there is a unique annotation identification code. With Database and the annotation identification code, through Annotation composer, the system can make dynamic control of the annotation keywords, such as whether

displaying annotation marks, by regarding each annotation as an object stored in the Database.

As marked annotations getting more and more, the cognitive load to read the article increases accordingly so that the article readability decreases for annotation systems. Therefore, to reduce the problem of cognitive overload, another innovative functionality developed in this system is that the user can freely switch between the *annotation mode* (Figure 5) and the *review mode* (Figure 6) to neatly review the "right" article after correction without showing the correction marks. In review mode, the annotation tools are hidden whether the user owns the annotation token.

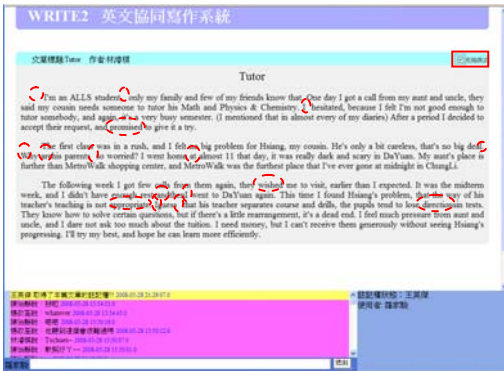Figure 5.   Illustration of Annotation Mode

Figure 6.   Illustration of Review Mode

E.   Message Interface

There are two types of messages in this system: dialog message and system message. During the synchronous collaborative writing revision processes, users can participate in one-to-one, one-to-many, or many-many conversations through an online chat room included in this system. As suggested by [10], text-based synchronous discourse can provide the opportunity of quick feedback as well as to plan and shape their language before sending it so that decreases the likelihood of interruption and levels of anxiety than traditional oral discourses. Additionally, it can assist learners to visualize the talk process and provide an environment that allows them to ask questions, discuss, interact, and seek assistance from others. Dialog messages list the record of the text-based synchronous discourse.

Not only the dialog messages but also the system messages are presented to users. System messages, such as who has acquired and/or released the annotation token and who has created and/or deleted an annotation mark, can provide users a more comprehensive understanding among user interactions. To easily distinguish the various message types, different background colors are used. The pink background is used for dialog messages; the yellow background is used for system messages of the annotation token; finally, the red background is used for system messages of annotation creation and/or deletion.

F.   Message Manager

Message manager is responsible for the annotation right control and the concurrent display of annotation marks of articles. In this system, the annotation token status area, which is located at the lower left of the screen, will be refreshed periodically. As refreshed, the system reviews the system messages not only to check whether new annotations have been created and/or annotations have been deleted but also for annotation right transfer. If there are any annotation creation and/or deletion, Message manager will then update the "article annotation area" in the client side for all users to ensure that all users can have the same reviewed article (article with "annotation marks"). If acquiring and/or releasing annotation token happens for some user, the system will update the annotation token status area and article annotation area simultaneously for this user.

It is important to define an appropriate refresh period. If the refresh period is too short, it not only decreases the system performance but also increases the user cognitive load. On the other hand, if the refresh period is too long, the system cannot effectively display "real-time" annotation creation and/or deletion to all users. Usually, it takes few seconds to create and/or delete an annotation, therefore, in this system, the refresh period is set to be five seconds.

III.   CONCLUSIONS

Collaborative writing, one of the methodological innovations for language teaching, is "the social act of creating a single, coordinate document with two or more participants". Revision is the last process for writing. Corrective feedback and error correction, critical tasks for revision, are important for English as a Second Language/English as a Foreign Language (ESL/EFL) writing instruction. Research findings showed that students' major difficulty in error correction lies in their failure to detect errors. Also, researchers proposed that error analysis can be reinvented in the form of computer-aided error analysis, a new type of computer corpus annotation. Annotations on digital documents can be easily shared among groups of people, making them valuable for a wide variety of tasks, including providing feedback. Collaborative corrective feedback and error correction with asynchronous annotation systems have been developed by researchers. It is suggested that collaborative teams can be enhanced by applying collaboration in a synchronous environment. However, few synchronous annotation systems are developed for corrective

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