

Computer Supported Composition Learning with Collaborative Writing Tools

Hiroaki Ogata and Yoneo Yano

**Faculty of Engineering, Tokushima University
2-1 Minami-josanjima Tokushima 770, Japan
TEL: +81-886-56-7498 FAX: +81-886-23-2761
E-mail: {ogata, yano}@is.tokushima-u.ac.jp
URL: <http://www-yano.is.tokushima-u.ac.jp/>*

Abstract: This paper summarizes computer supported language learning environments using collaborative writing tools. Moreover, this paper proposes a markup-based composition learning support system called **CoCoA** (Communicative Collection Assisting System). It allows students and teachers to exchange marked-up documents via Internet, and its environment is very similar to a real one in which people use paper and pen. In order to record and exchange corrected compositions with some marks and some comments, this paper also proposes **CCML** (Communicative Correction Mark-up Language), which is based on **SGML** (Standard Generalized Mark-up Language).

Keywords: Computer supported language learning, composition learning, computer supported collaborative writing, online markup, SGML

1. Introduction

Recently, researchers in the educational systems area are attempting to provide technological support for cooperative and collaborative learning advocated by educational theories[12]. The explosive growth of networking, in particular, raises the possibility of widespread collaborative and open-ended learning activities[6]. We have been focusing on technological support for open-ended and collaborative learning activities[11]. In composition studies, the theoretical view of learning coupled with the shift in writing pedagogy toward an open-ended and learner-centered approach, has created a surge of interest in collaborative learning in such way as to prize conversation and interaction among students and among students and teachers.

In computer-based classrooms, writing teachers and students use various collaborative writing tools to substantiate theories of writing. These tools can (1) change the way students and teachers interact; (2) enhance collaborative learning opportunities; (3) facilitate class discussion; and (4) move writing from solitary to more active, social learning. Writing compositions includes various sub-processes such as planning, transcribing, and revising, which do not need to occur in any fixed order[14]. In particular, the review process is very meaningful in collaborative composition studies. Although researchers developed some markup models, the generalized format for encoding and exchanging marked-up documents has not been proposed.

This paper describes **CoCoA** (Communicative Collection Assisting System) which offers support to overseas students and teachers to exchange marked-up documents via Internet. This environment is very similar to a real one in which people use paper and pen. CoCoA allows teachers not only to correct the compositions sent from students by E-mail, but also allows students to see where and why the teacher had corrected them. CoCoA improves the opportunities that learners have for writing Japanese compositions and for receiving instructions from teachers. This paper also proposes **CCML** (Communicative Correction Mark-up Language) based on **SGML** (Standard Generalized Mark-up Language)[8] which is one of Internet key technologies.

We have been investigating about technological support for Japanese language learning among foreign students. For example, CAI systems called Kanji Laboratory[7], JUGAME[17], and JULLIET[10] were developed to assist Kanji learning. Moreover, intelligent agents based on CACL environment called GRACILE[1] which supports collaborative writing focusing on Japanese composition conjugation. However, a on-line mark-up supporting system for Japanese language learning has not been proposed. In Japanese writing classroom, teachers can individually review learners' documents using paper and pen[13]. It takes much time for teachers to do that. Therefore, we have designed and implemented CoCoA for Japanese writing classes.

This paper is organized as the following. First, section 2 summarizes collaborative writing tools for learning to write. In section 3, we describe CCML based on the experimental results of correcting Japanese compositions written by learners using paper and pen. Section 4 illustrates the design and its implementation of CoCoA. Finally, the concluding remarks are given in section 5.

2. Collaborative writing tools and markup models

2.1. Taxonomy of collaborative writing tools

Recently, teacher-centered instructional approaches in traditional writing classrooms are replaced with more active, learner-centered learning approaches using collaborative writing tools. In computer-based classrooms, writing teachers and students use various software tools to substantiate theories of writing. Bonk and King[2] classified collaborative writing tools into the following:

- (1) *Email and delayed messaging tools*: allow users to directly send messages or files from one computer to another using point-to-point transfer or to a centralized server using a store-and-forward strategy; useful for providing documents feedback.
- (2) *Remote access/delayed collaborative writing tools*: allow users to remotely access, update, and control files stored on other computers; helpful for revision or review of a document; e.g., Prep Editor[9] and Mark-Up[18].
- (3) *Real-time dialoguing and idea generation tools*: allow multiple users to simultaneously brainstorm on a topic by sending messages to each other; typically have two windows: a shared window and a private window for creating and editing dialogue; useful for prewriting and postwriting; Group Writer and Connect[20], for example.
- (4) *Real-time collaborative writing tools (text only)*: allow more than one person to work on a document concurrently; changes are immediately visible to all participants; useful to text creation revision; e.g., Realtime Writer and Aspects[19].
- (5) *Cooperative hypermedia tools*: most allow document sharing capabilities of Level 4

above, including: hypertext, graphics, video images, music, speech, or animation; for instance, CSILE[15] and KnowledgeBuilder[21].

In this paper, we focus on level 2 of tools that assist teachers and students to review documents asynchronously.

2.2. Taxonomy of markup models

There are some editing systems that support teachers to review and correct the students' drafts with online mark-up. Farkas & Poltrock[4] classified the mark-up models as the following:

- (1) *Silent editing model*: The editor works on the author's draft using the normal features of a word processor. This is the simplest model and it requires no special techniques. However, it is very difficult for the author to check the editor's work. This model is destructive because the editor cannot readily recover the original words once he/she has changed it.
- (2) *Comment model*: This model employs pop-up notes, temporary footnotes, hidden text, and special symbols placed within the text. The set of special symbols must be created out of ASCII characters. This model can work for special groups and ad-hoc situations. A system called Mark-Up was proposed with this model.
- (3) *Edit trace model*: In this model, the editor works in the manner of an author, deleting, adding, and moving text as usual. However, the computer can compare the editor's new version with the original text, and allows the author to view the draft that contains the editor's changes. This model has difficulty in heavy editing. For example, Microsoft Word for Windows accepts this model.
- (4) *Traditional mark-up model*: This adapts the traditional paper mark-up model to the computer screen. The symbols are both familiar and intuitive for editors and authors; for example, deletion, insertion, and move. For instance, Red Pencil allows the editor to apply a complete set of traditional editing symbols directly to a document. Another implementation, called HandWriter has such a advanced technology that it lets the computer recognize human handwriting symbols. The editor uses "digital ink" to mark a traditional editing symbol along with the words. Moreover, MATE[5] allows the editors to use both digital ink and voice command toward pen and voice computing. In this model, authors and editors can interpret the editor's markings much more readily than in the edit trace model.

Although there are many systems that employ mark-up which allow multiple users to mark-up an electronic document as if they were marking up a printed copy of the document, such systems do not globally come into practical and wide use in composition writing classes. Therefore, the system must provide a generalized format for encoding and interchanging marked-up documents using Internet.

3. CCML

CCML is an application of SGML. SGML is an ISO standard (ISO 8879:1986) which supplies a formal notation for the definition of generalized mark-up languages. SGML are device-independent, and system-independent methods of representing texts in electronic form. That is to say, SGML is a set of mark-up conventions used together for encoding texts. A mark-up language must specify what mark-up is allowed, what mark-up is required, how mark-up is to be distinguished from text and what the mark-up means. We investigated how to correct Japanese compositions that overseas students wrote on paper. According to the experimental results, we propose CCML for exchanging marked-up documents.

3.1. Experimental results

In the experiment, we used 18 compositions written by 18 students respectively. They were beginners in Japanese and they came to Japan from various countries; e.g., China, Malaysia, Guinea, and so forth. Then, we chose 13 master course students of Japanese and one teacher of Japanese education who can write Japanese precisely as reviewers of the learners' compositions. The teacher had four years of teaching experience, including one year of computer programming experience. They reviewed three compositions that have 713 words. The reviewers found and corrected 53 errors in the documents during 90 minutes.

The experimental results are summarized as the following:

- (1) The Japanese compositions written by learners contained some compound errors. Hence, it is very difficult for the reviewers to understand what they meant and how to correct the compositions. Editors cannot expect the support of computerised text analysis programs[3] to correct the documents automatically.
- (2) The respective reviewers used various kinds of marks for the proofreading.
- (3) The importance of marks was varied in the document.
- (4) Annotations of the reviewer are very important to give effective instruction to the student.

Based on these results, we analyzed the marks, the importance of corrections, and the annotations.

3.2. CCML structure

As shown in figure 1, CCML document consists of three parts: header, body and close. "Header" represents additional information about the document. The marks for review are shown in the "Body" as CCML tags (see Table 1). "Close" shows the editor's comments.

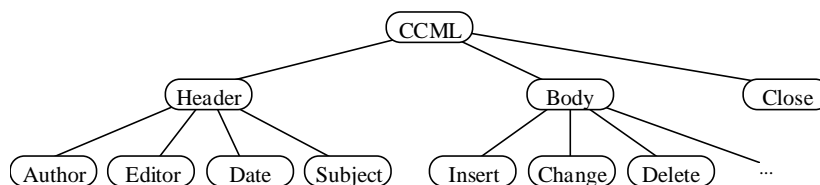


Figure 1: The tree structure of CCML documents.

Japanese Industrial Standard (JIS) defines 20 marks and 18 sub-marks as the marks for proofreading[16]. A mark shows the spot of correction, e.g., text insertion. All the marks are not required in our situation because documents are inputted with a computer. Based on this standardization, six marks were used in our experiment. Table 1 shows the six marks and one annotation. In one sentence, "insert," "replace," and "delete" marks were used, while "join," "separate," and "move" marks were used over two sentences.

Table 1: Marks and CCML tags.

	Correction	Mark	Tag
Single sentence	1. Insert		<Insert string="text">
	2. Replace		<Replace string="text"> text </Replace>
	3. Delete		<Delete> text </Delete>
Multiple sentences	4. Separate paragraph		<Separate>
	5. Join paragraph		<Join>
	6. Move		<MoveFrom refid="ID"> <MoveTo id="ID"> text </MoveTo>
	7. Annotate		<Annotate type="question" "explanation" string="text">

3.3.Level of marks

We found that the marks do not have the same level of importance. We identify the following levels:

- (1) Level 1: This is a mark which the learner do not need to revise in the document.
- (2) Level 2: This is a mark which the learner had better to correct the document.
- (3) Level 3: This is a mark which the learner should correct in the document.

The highest level is three, that denotes the most important mark to review. Using the importance level that the teacher had entered, the system provides the learner the marks which he/she wants to see. Therefore, the learner can avoid the information overload from the reviewed documents. Every tag in table 1 has an attribute "level" that a teacher gives a number from one to three. Its default is two.

3.4.Level of annotations

It is very important for a teacher to annotate the marked text for instructing in composition. For example, PREP Editor [9] is a word processor that allows writers and reviewers to create electronic margins, or columns, in which they can write and communicate through their annotations. We identify the following different kinds of annotations:

- (1) Explanation: This is used for explaining the reason of a correction.
- (2) Question: This is used for asking the learner a question; e.g., what do you want to write?
- (3) Comment: This shows the educational view of the teacher with respect to the document.

3.5.Features of CCML

The main characteristics of CCML are:

- (1) CCML presents seven marks with their respective level of correction.
- (2) A text without all of the mark-ups from a CCML document is an original text
- (3) A document applied the CCML mark-ups is a revised text.
- (4) Because CCML documents are text-format, it is easy to send them by email.
- (5) CCML is independent of both devices and systems.
- (6) It is easy to reuse CCML documents as a full-text databases.

The first feature was derived from our experiment. Because of the second and third features,

learners can track the changes in the texts from their CCML documents. The other features are the same as those of SGML.

4.CoCoA

CoCoA consists of CoCoA_Editor and CoCoA_Viewer. A teacher corrects the document of overseas students with CoCoA_Editor and the system saves the marked document in CCML format. CoCoA_Viewer interprets the CCML document, and shows the learner the marked document. While CoCoA_Viewer corresponds to a WWW browser like Netscape Navigator, CoCoA_Editor has the same features of a HTML editor.

4.1.Learning processes using CoCoA

By using CoCoA, a learner receives the instruction about Japanese composition from a teacher with the following processes:

- (1) The learner writes an original text with his/her familiar editor.
- (2) The learner sends the document to his/her teacher with his/her email tool.
- (3) Using CoCoA_Editor, the teacher corrects the document with marks and annotations. The system makes the documents double-spaced and it allows the teacher to set the importance level to the marks in the document.
- (4) After CoCoA_Editor saves the marked text as a CCML document, the teacher sends it to the learner with his/her email tool.
- (5) CoCoA_Viewer provides the learner with the marked text after interpreting its CCML document. Then, the system allows the learner to select the important level to see the important part of the marked text.
- (6) CoCoA_Viewer automatically generates both the original text and the revised one from the CCML document. After editing the revised text, the learner can send it again to the teacher and continue refining the text.

4.2.User interface

Figure 2 shows the screen snapshot of CoCoA. By selecting a mark from the mark palette shown in the window (A), a teacher can correct learners' documents. Moreover, the teacher can annotate the document using the annotation palette, and he/she can classify the marks using a window which looks like (B). The "undo" button erases corrections. In figure 2 after the teacher substitutes "を臨む" with "に参加する" which means "attend", he/she can determine that the important level of the correction is three.

On the other hand, a learner obtains a marked text in a window (C). In this case, CoCoA_Viewer provides only the marks over the level two of importance. "?" denotes a question and "*" shows a explanation from the teacher. The system displays the contents of the annotation after clicking the mark. As shown in the message window, the learner can reply to the message and send it after revising the document.



Figure 2: Screen snapshots of CoCoA_Viewer and CoCoA_Editor.

5. Conclusions

In this paper, we proposed a computer mediated language learning system called CoCoA and CCML for exchanging electronic marked documents. Although we tried to use CoCoA in Japanese language learning in this paper, CoCoA is independent of the domain of language. If W3C (World Wide Web Consortium) publish XML (Extensible Markup Language) that is the extension of SGML and HTML, it will be easy to adopt CCML into Web browsers. Therefore, CoCoA will be able to be used for learning any language. In our future research, we will investigate how to classify students' bugs in their drafts, and how to assist a review process with AI technologies.

We have implemented CoCoA in Tcl/Tk on both Microsoft Windows 95 and Sun workstations. A Japanese version of this software is distributed to other researchers and developers for demonstration. For further information, our home page (<http://www-yano.is.tokushima-u.ac.jp/research/cocoa/cocoa.html>) is available.

Acknowledgment

This research is supported in part by the Grant-in-Aid for Scientific Research (B) (2) No.09558017 and No.09480036 from the Ministry of Education, Science, Sports and Culture in Japan.

References

- [1] Ayala, G. & Yano, Y. (1995). "GRACILE: A framework for collaborative intelligent learning environments", *Journal of the Japanese Society of Artificial Intelligence*, vol.10. no. 6. pp.156-170.
- [2] Bonk, J. C. & King, S. K. (1995). "Computer conferencing and collaborative writing tools: Starting a dialogue about student dialogue", *Proc. of CSCL 95*.
- [3] Brock, N. M. (1995). "Computerised text analysis: Roots and research," *Computer Assisted Language Learning*, Vol.8, No.2-3, pp.227-258.
- [4] Farkas K. D., & Poltrock, E. S. (1995). "Online editing mark-up models, and the workspace lives of editors and writers," *IEEE Trans. in Professional Communication*, 38(2), pp. 110-117.
- [5] Hardock, G., Kurtecbach, G., & Buxton, W. (1993). "A marking based interface for

- collaborative writing,” *Proc. of the ACM Symposium on User Interface Software Technology*, pp.259-266. (available in <http://www.dgp.toronto.edu/OTP/papers/bill.buxton/mate.html>)
- [6] Harasim, L., Hiltz, R. S., Teles, L., & Turoff, M. (1995). *Learning Networks -A field guide to teaching and learning online-*, The MIT Press.
- [7] Hayashi, T., & Yano, Y. (1994). “Kanji Laboratory: An environmental ICAI system for Kanji learning,” *IEICE Trans. on Information and Systems*, E77-D(1), pp.80-88.
- [8] Herwijnen, E. (1990). *Practical SGML*, Kluwer Academic Publishers.
- [9] Neuwirth, M. C., & Wojahn, G. P. (1996). “Learning to write: Computer support for a cooperative process,” *CSCL: Theory and practice of an emerging paradigm*, Koshmann, T. (Ed.), Lawrence Erlbaum Associates, Publishers, pp.147-170.
- [10] Ochi, Y., Yano, Y., & Hayashi, T. (1996). “JULLIET: Interactive learning environment for Kanji compounds learning,” *Proc. of ED-Media '96*, pp.539-544.
- [11] Ogata, H., & Yano, Y. (1997). “Active knowledge awareness filtering toward efficient collaborative learning,” *Proc. of AI-ED 97*, Kobe, Japan. (in press)
- [12] O'Malley, C. (1994). *Computer supported collaborative learning, NATO ASI Series, F: Computer & Systems Sciences*, Vol. 128.
- [13] Sato, M., Kano, C., Tanabe, K., & Nishimura, Y. (1994). *Practical Japanese Compositions*, Bonjin-sya, in Japanese.
- [14] Scardamalia, M., & Bereiter, C. (1986). “Research on written composition,” M. Wittrock (Ed.), *Handbook of research on teaching* (third ed.), Macmillan, pp.778-801.
- [15] Scardamalia, M., & Bereiter, C., Student communications for the advancement of knowledge, *Comm. of ACM*, Vol.39, No.4, pp.36-37, 1996.
- [16] Shimano, H. (1986). *Handbook of proofreading*, Miki Publishers, Japan, in Japanese.
- [17] Yano, Y., Miyoshi, K., & Hayashi, T. (1993). “Development of a game style environmental ICAI system for Kanji idiom learning,” *Proc. of ICCE '93*, pp.411-413.
- [18] http://www.mstay.com/mu20_ab1.html
- [19] <http://english.ttu.edu/acw/newsletter/Korohais28.html>
- [20] <http://www.wwnorton.com/connect/ntc.htm>
- [21] <http://josnet.jostens.com/schools/kb/knowledgebuilder.html>