Development and Evaluation of an online handwritten feedback-giving support system in learning Japanese writing

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This paper describes the development and evaluation of an online handwritten feedback-giving support system in learning Japanese writing. First, twelve Japanese language teachers were asked to evaluate the usability of the system. Then the study examined students' perceptions on the handwritten feedback in writing practice. The results show that the system is helpful for teachers to give handwritten feedback, and the students said the handwritten feedback was easy to understand which might lead to a positive effect on teacher's presence. Although it is a small-scale study, we look forward to create awareness among language teachers on the importance of such paper-like handwritten feedback to students in Japanese writing instruction and the importance of learning to give feedback innovatively and efficiently using new media.

The JALT CALL Journal

Why is error treatment necessary for L2 writers?

Error correction and grammar instruction were major, perhaps even the primary, components of writing instruction in L2 (second language) classes (Ferris, 2005). At the same time, providing error feedback on students' essays is a very complicated issue in second language writing pedagogy. Actually, teachers' and theorists' views of the importance of grammar, error correction and accuracy have undergone several shifts. As

seen in the critical debate between Truscott (1999) and Ferris (1999), the research results and theories over error feedback are inconclusive and are still being discussed from various perspectives. In line with Truscott's argument, some researchers have pointed out that they did not find any significant effects of instructors' error feedback on writing outcome (e.g., Cohen & Robbins, 1976; Polio *et al.*, 1998). On the other hand, others (e.g., Robb, 1986; Frantzen & Rissell, 1987) have pointed out the effectiveness of error feedback, citing the reduction of errors in students' essays.

This study was conducted on the assumption that error correction, grammar instruction and editing-strategy training have positive effects on student writers' overall development. Researchers have reminded us that the accuracy of students' papers will not magically improve all by itself (Eskey, 1983; Horowitz, 1986). Some scholars also emphasize the inherent difference between L1 (first language) and L2 writers (Leki, 1990; Silva, 1988; Zhang, 1995). One of the inescapable differences between L1 and L2 student writers is that the nonnative speakers make errors related both to negative transfer from their L1 and to incomplete acquisition of the target language. Because L2 students, in addition to being developing writers, are still in the process of acquiring the L2 lexicon and morphological and syntactic systems, they need explicit intervention from their teachers to make up for these deficits and develop strategies for finding, correcting and avoiding errors. Several studies have demonstrated that error feedback can help students to improve accuracy over a short term, in other words, on revisions of the same essay or on targeted patterns of error over the course of a semester (Fathman & Whalley, 1990; Ferris, 1995; Lalande, 1982). Also, as noted by a number of researchers, students value teacher feedback on their errors and think that it helps them to improve their writing (Cohen, 1987; Leki, 1991; Radecki & Swales, 1988). Most importantly, instructors need to work for finding the best ways to help their students become "independent self-editors" of their own work (Bates, Lane, & Lang 1993; Ferris, 1995). At this point, we can at least conclude that most language instructors and L2 learners believe in the potential of error correction, grammar instruction and editing-strategy training to have positive effects on student writers' overall development (Ferris, 2005).

Feedback methods in an e-learning environment

There are many methods that teachers can use to correct digital writing. For example, teachers can correct printed writing directly on the paper; they can correct the writing using Microsoft Word's (MS) comment function, which inserts corrections between lines or comments on the right side margins. When learners use MS Word to read teacher feedback, they have to click the comments on the right hand side of the pages to find out which word is connected to the corrections by the red line. This is inconvenient and results in them ignoring some important feedback (Li & Akahori, 2006). Moreover, teachers can also add corrections with marked-up language that can be used via the Internet or email. For example, MATE and CoCoA systems enable marking-up with a stylus, facilitating cooperative and collaborative writing activities (Ogata, Hada, & Yano, 2001). Another possibility is to use AWE (Automated Writing Evaluation) systems based on NLP (Natural Language Processing) to automatically check the grammatical or structural mistakes (Yang& Akahori, 1998). AWE has become increasingly available in classrooms and for large-scale assessments (Elliot, 2004). For instance, the famous *e-rater* and *Criterion*, developed by ETS (Educational

Testing Service) in the United States, can provide a holistic score and feedback to students about their essays. In validating AWE systems, most previous studies have emphasized evidence of agreement between computer generated and human generated scores (Burstein *et al.*, 1998; Foltz *et al.*, 1998; Larkey, 1998; Page & Peterson, 1995), where the scores are usually close to those provided by human raters. However, although they can supply varied feedback, none of them is remotely similar to what a trained writing instructor can provide, and the ability of students to make use of the feedback is also questionable (Warschauer & Ware, 2006). As Otoshi (2005) revealed, *Criterion* experienced difficulties in detecting errors in all categories, and some model sentences are not considered to be effective unless learners can understand them. It is suggested that AWE can never become a replacement for a human instructor's feedback. Human instructors are still required to check surface errors as well as global errors, and to give effective feedback.

Tablet PC

With the rapid development of tablet PC, PDA and other touch devices, it is now quite common to write directly on screens using pen-based input devices. In fact, many schools have attempted to introduce such input devices in their lectures or use them to improve students' performance (Lebow *et al.*, 2004). Backon (2006) argues that the pen and digital ink are a part of a new paradigm that is closely tied to individual learning although research in this area is sparse, where individual learning and creativity are more stimulated by a stylus rather than a keyboard. As an input tool, a keyboard is designed to communicate faster but is not necessarily better. In contrast, the digital pen is an extension of the human hand and is naturally connected to several regions of the brain. Backon argues, "the pen approach suggests more flexibility in teaching and learning". Both quantitative and qualitative data have shown that the interactive software used in the pen-enabled environment engaged students more in learning by enhancing note-taking, understanding and communication as well as increasing attention and motivation in the learning process. It appears that the use of pen-based devices can make our handwritten feedback on students' writing easier, quicker and more individualized, while making the computer look and feel like paper, with added advantages over paper.

Theory of Social Presence

The presence of the teacher is an essential element for enhancing meaningful interactions to activate second language communication and is a strong predictor of satisfaction in educational environments (Garrison & Anderson, 2003). There are various views around definitions of the social presence. Originally, Short, Williams and Christie (1976) proposed the social presence as a term "salience" which is a socio-psychological or interpersonal phenomenon. Gunawardena (1995) and Richardson and Swan (2001) defined it as the "perception" or "the degree to which participants in mediated communication feel socially and emotionally connected" from the viewpoint of a recipient. On the other hand, Garrison and Anderson (2003) defined it as "the ability of participants in a community to project themselves socially and emotionally, as 'real' people, through the medium of communication being used" from the viewpoint of a sender. Regarding factors to enhance social pres-

ence, Gunawardena (1995) mentions the degree of "intimacy" which depends on physical distance, eye contact, and smiling, and "immediacy" of the social interaction. Hackman and Walker (1990) examined the role of instructors in distance learning, and found that both verbal and non-verbal behaviors of the instructor have a positive effect upon perceived learning and satisfaction, claiming that "off-campus students felt as though they learned more when their instructor provided them with specific feedback on individual work through comments on papers, oral discussion or some other means, solicited phone calls." Other studies have also considered the effects of instructor immediacy on various learning environments, from traditional classroom to distance education environments, and similarly found that such behaviors significantly influence the learning experience (Anderson, 1979, Freitas, Myers, & Avtgis, 1998). Accordingly, this study examines the use of non-verbal personalized handwritten feedback to better understand the error feedback and to enhance the presence of an instructor in an e-learning environment.

The present research focuses on the integration of handwritten error feedback over the Internet in order to create an e-learning environment close to traditional face-to-face, paper-based writing corrections by language teachers. It is important to determine whether handwriting tools can help teachers to give feedback in an e-learning environment. It is also important to evaluate students' perceptions regarding this kind of personalized handwritten feedback, and whether there is any relationship between handwritten feedback and students' perceptions of the teacher's presence.

System design and development

Prior to the study, the authors designed and developed an online handwritten feedback-giving support system—DInCo (Digital Ink Correction). It was developed using Microsoft Tablet PC SDK and Agilix InfiNotes control which was integrated with rich ink note-taking tools including lines, highlights, color, eraser, extend tools, etc. With this system, learners can submit their writing so that it can be saved in the server database by directly inputting in the textbox area in a web page. When teachers access the web page for the first time, they will be prompted to download and install *ActiveX* control that is integrated with digital ink and handwriting tools. With the *ActiveX* control, the teacher can directly give handwritten feedback on students' writing page on any PC with Windows XP (Service Pack 2) or Windows XP for Tablet PC (Service Pack 2). With a pen or highlighting tools, teachers can handwrite feedback or emphasis on the errors in the writing. With the extend tool, the teacher can extend the right or bottom space of the writing page to give more comments and feedback. With the eraser tool, teachers can erase anything they wrote that was not correct or they were not satisfied with. The undo or redo tools can be used to cancel what was just inputted. Of course there are various colors for the pen and highlighting tools to describe or emphasise different kinds of errors at the teacher's discretion (see Figure 1). When corrections are finished, the handwritten feedback can be coordinated with the original writing and saved in MHTML (Mime HTML) format on the server using the save button. With MHTML format, students can read the handwritten feedback in their writing just using a web browser such as *Internet Explorer* without the need for special software.

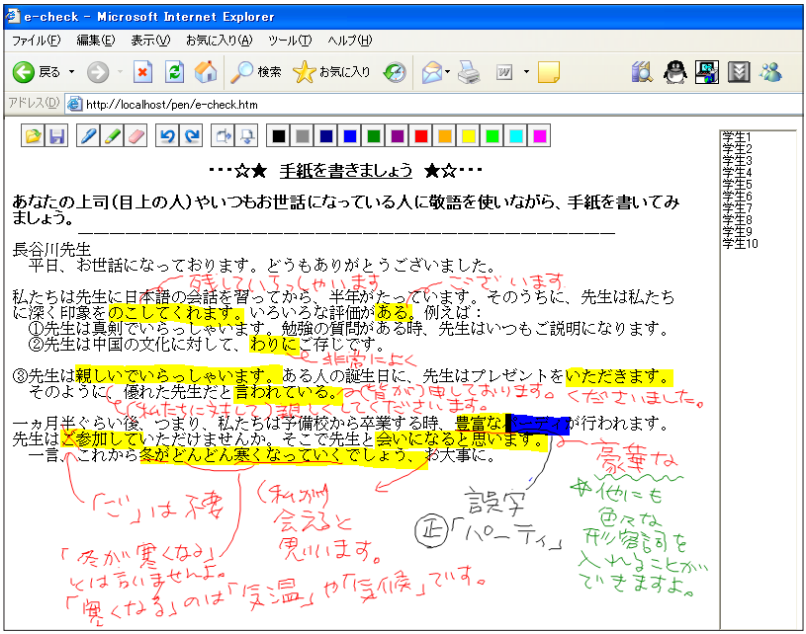


Figure 1. snapshot of handwritten feedback in student's writing

Two surveys were conducted to firstly evaluate the usability of the system when teachers gave handwritten feedback in students' digital writing, and secondly to evaluate the perceptions of students on teachers' handwritten feedback.

The Study

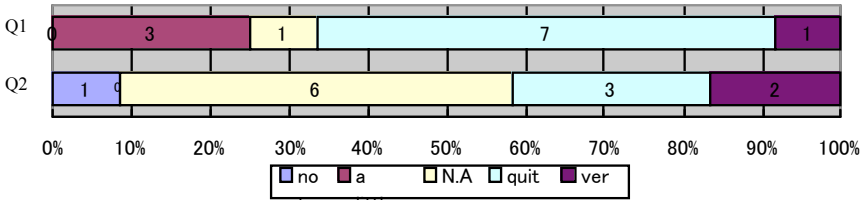
First, twelve Chinese students at a Japanese language school in China were requested to write a short piece in Japanese on the Internet. Twelve Japanese teachers (native Japanese speakers) in Japan were then asked to use DInCo to give handwritten feedback to a randomly selected piece from the twelve students. In the first survey, they gave handwritten feedback using a touch panel (Wacom DTU-710) connected with a laptop. The Wacom touch panel was selected because of its sensitive touch screen and its big panel which is flexible for handwriting. When they finished giving feedback they were asked to answer a questionnaire with 5-point scale ratings from 1 (not at all) to 5 (very much) to evaluate the usability of the system.

Two Japanese teachers were selected to give handwritten feedback to all the twelve pieces using the system. The handwritten feedback results were saved in MHTML format and were distributed to the students by email. After the students received the email and read the handwritten feedback, they were asked to answer a questionnaire with 5-point scale ratings from 1 (not at all) to 5 (very much) to evaluate the handwritten feedback and their perceptions to the teacher.

Data Analysis

Questionnaire to teachers

From the results regarding teacher impressions of DInCo, we can see that 67% of teachers thought this system was helpful, and only one person didn't express a desire to use this system in the future (see Figure 2).



Q1: Do you think this system is helpful?

Q2: Do you like to use this system in your lecture in the future?

Note: N.A. is an abbreviation of "not applicable".

Figure 2. answers about impression of DInCo

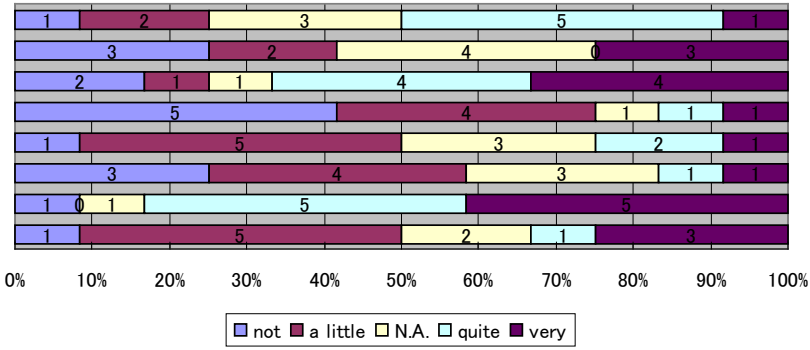
Basically, the teachers involved in this study indicated that they thought the system was helpful and would like to use it in their later lectures. From the answers about their impressions of pen-based input (see Figure 3), we found that most teachers thought their handwriting styles on touch panel could not be expressed as well as their personal writing style on paper (Q6), and most teachers said it was difficult to write on the touch panel (Q8). Most teachers said it was easy and convenient to draw lines and graphics using the pen-based input device compared to a keyboard or mouse. Because Japanese kanji is complex with many strokes, it is difficult to write kanji small enough to fit between the line spaces.

Although most teachers didn't think the font size of students' writing was overly small but they thought it was better to make the line spaces much bigger and they wanted to be able to change the line spacing as they like (Q3, Q4), because they preferred to write their feedback between the lines rather than in the page margins.

About 83% of teachers said the interface of DInCo was easy to read (Q7), but most of the teachers indicated that it was difficult to write on the touch panel (Q8). From their explanations we could conclude that they weren't familiar with pen-based input devices and the surface of touch panel was more slippery than paper.

From Q1 and Q5, it was possible to see that through pen-based input device, teachers could freely write anything in any location of the panel and could easily erase or modify what had been written on the screen by the eraser or undo tools.

In the interview, we could see that teachers didn't spend as much time giving handwritten feedback on the touch panel compared with paper, even though it was the first time for most of the teachers to use such a pen-based input device to give feedback.



Q1: Do you think it is easy to modify or update the correction?
Q2: Do you think it spends too much time to correct paper with touch panel?
Q3: Do you think it is better to make the line space much bigger?
Q4: Do you think the font size of the compositions is a little small?
Q5: Do you think there are location limits on handwriting on panel?
Q6: Do you think the font written on touch panel can accurately express your personal writing style?
Q7: Do you think the interface of DInCo is easy to read?
Q8: Do you think it is easy to write on touch panel (Wacom)?

Figure 3. Answers about impression of pen-based input by the teachers

Questionnaire to students

The results of the questionnaire to students revealed that 45% students indicated that they had nobody to give feedback to their Japanese writing, only 22% said their writing was checked by language teachers, and the others were checked by Japanese friends. For the question regarding what kind of media the teacher usually used to give feedback to their writing, 89% students responded that it was given on paper, while the others said by Microsoft *Word*. To the question of whether they had experience of submitting their writing to teacher over the Internet, 78% responded that they never had done so before. For the question of whether they thought teacher's feedback was important or not, 100% of the students replied that they thought it was very important.

The purpose of the study was to evaluate the students' perceptions of handwritten feedback, its usefulness and their willingness to use it, and their perceptions of the teacher after reading the handwritten feedback. Firstly, all the answers to the handwritten feedback given by two teachers were compared and no significant differences were found. Then all the answers in the questionnaire were analysed by means (see Figure 4). The results showed a high mean in most of the question items, from which we can conclude that the handwritten feedback written in the DinCo system had a positive effect on students. For

example, students said that they could understand the meaning of the teacher's handwritten feedback (M=4.80, SD=.422). They also indicated that they liked having the teacher give handwritten feedback to their writing (M=4.40, SD=1.075), and that the use of color in the feedback was helpful to distinguish the teacher's handwritten feedback from their own writing contents (M=4.50, SD=.707). Students were satisfied to the teacher's handwritten feedback (M=4.60, SD=.516), and through the handwritten feedback, they could feel the "seriousness" of the teacher when correcting their writing (M=4.20, SD=1.033). They responded that the handwritten feedback could enhance the presence of the teacher (M=4.60, SD=.516). Students thought the system was easy to use (M=4.30, SD=.949), and they would like to use the system again (M=4.80, SD=.422).

We also tried to categorize the questionnaire into smaller factors for further analysis. Due to the small sample size, we categorized the questionnaire into four factors according to the contents of each question item. The students' responses in the questionnaire could be grouped into the "usability of the system" (M=4.2, SD=.56, including items Q7, Q8, Q9, Q10, Q14, Q15, Q23, and Q24), "perceptions of handwritten feedback" (M=4.56, SD=.17, including items Q11, Q12, Q13, Q16, and Q18), "motivation in learning writing" (M=4.15, SD=.21, including items Q17 and Q22), and the "presence of teacher" (M=4.43, SD=.21, including items Q19, Q20, and Q21). The average for each factor showed positive correlations among these factors. From the results, we could conclude that teachers' handwritten feedback has a positive effect on students' attention and their understanding of the feedback. The handwritten feedback also had positive relation with students' motivation to learn Japanese, and the presence of the teacher. We could therefore conclude that when using the DInCo system to give handwritten feedback to students' writing, it could help students to understand the error feedback and could enhance the presence of the teacher that would lead to a positive effect on students' motivation regarding learning Japanese writing.

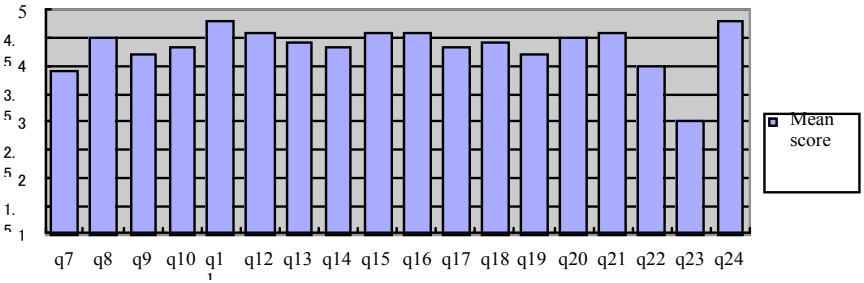
Discussion & Conclusions

There are a number of factors that limit the generalization of the present study. Firstly, the limited number of participants is too small to categorize the question items by factor analysis. This limits the statistical power available to conduct a factor analysis and to conduct a correlation analysis on the questionnaire to students. With a larger sample, more clear relationships between factors in students' perceptions on handwritten feedback might have been found.

In addition, some long-term studies should be conducted to evaluate whether the handwritten feedback could lead to greater consciousness for self-correction and improve learners' writing performance than other forms of error feedback.

In this study, we used digital ink technology developed an online handwritten feedback-giving support system. Teachers can give handwritten feedback on students' digital writings on web pages just like what they did on paper. From results of the questionnaires, we could conclude:

Teachers tended to like using the DInCo system to give handwritten error feedback on students' writing because of the various writing tools. It was convenient for them to modify and update what they wrote, and they could also jot anywhere on the writing just like on



Q7. Do you think the handwritten feedback is easy to read?
Q8. Do you think the different color is helpful for reading?
Q9. Do you think the color is easy to read?
Q10. Can you focus your attention to the handwritten feedback?
Q11. Can you understand the meaning of the handwritten feedback?
Q12. Are you satisfied to the handwritten feedback?
Q13. Do you like this handwritten feedback system?
Q14. Do you think the system is easy to use?
Q15. Do you think it is interesting to use the system?
Q16. Do you think that handwritten feedback is helpful for understanding the feedback?
Q17. Do you get more confidence after reading the handwritten feedback?
Q18. Can you easily distinguish the feedback and your original writing?
Q19. Can you feel the serious of the teacher?
Q20. Can you belief the teacher's feedback?
Q21. Can you feel more closely to the teacher?
Q22. Can you feel more interested in learning Japanese writing?
Q23. Does it spend too much time to receive the result of the feedback?
Q24. Do you like to use the system again?

Figure 4. Mean score of answers on handwritten feedback by the students

paper. Because the system could be used in *Internet Explorer*, they could easily and quickly receive pieces of writing from students and submit their feedback results to students.

From the results of the questionnaire to students, it was possible to see that handwritten feedback had a positive relation with students' understanding of and satisfaction with teachers' feedback. The handwritten feedback had a positive relation with the presence of a teacher that might lead to an increase in student motivation in learning Japanese writing. Although this was a small-scale study, we look forward to creating awareness among language

teachers regarding the importance of such paper-like handwritten feedback to students in Japanese writing instruction, and the importance of learning to give feedback innovatively and efficiently using new media.

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