

# The Effects of Handwritten Feedback on Paper and Tablet PC in Learning Japanese Writing

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**Abstract**—This paper compares the effect of paper-based handwritten feedback (PBHF) and that of Tablet PC-based handwritten feedback (TBHF) in learning Japanese writing. The study contributes to the research on motivation, usability and presence when learners are given different media-based handwritten error feedback. The results indicated that there was little difference in the effect of the two media on motivation and usability factors. However, PBHF showed a positive effect on presence factor than TBHF. Also, there was little difference in proficiency improvement after the students reviewed different media based handwritten feedback. The results of this study suggest that language teachers should not use ICT with traditional strategies, but in an innovative way to improve their writing instruction and enhance learners' writing proficiency.

**Index Terms**—Second Language Acquisition, Tablet PC, error feedback, distance learning

## I. INTRODUCTION

### A. Error treatment for second language writers

Error correction and grammar instruction were major, perhaps even the primary, components of writing instruction in L2 (Second language) classes [1]. 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 [2] and Ferris [3], 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 pointed out that they did not find any significant effects of instructors' error feedback on writing outcome [4, 5]. On the other hand, others pointed out the effectiveness of error feedback, citing the reduction of errors in the students' essays as an example [6, 7].

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 [8, 9]. Some scholars also emphasize the inherent difference between L1 (first language) and L2 writers [10- 12]. 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 [13-15]. 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 [4, 10, 16]. Most importantly, instructors need to work for finding the best ways to help their students become "independent self-editors" of their own work [17, 14]. 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 [1].

### B. Feedback giving methods in e-learning environment

There are many methods that teachers can use to give feedback on digital writings. For example, they can correct the writings using Microsoft Word's comment function by which inserts feedback and comments between lines or on the right side margins; they can also add feedback with marked-up language that can be used via the Internet or email. For example, MATE and CoCoA systems could marked-up the writings with a stylus, facilitating cooperative and collaborative writing activities [18]. Another possibility is to use AWE (Automated writing Evaluation) system on NLP (Natural Language Processing) to automatically check the grammar or structure mistakes in writings [19], or teachers can correct printed-out writings directly on the paper.

The MS Word has all the feedback input in the right side margins connected by underlines, which make students confused and added a cognitive load to them resulting in dropping some important feedback information. AWE is an assessment system but not an instruction tool. It mainly focuses on validity, correlations between the score of the human raters and AWE [20]. In addition, AWE system must be "trained" with respect to a particular prompt. This requires a large sample size and is impractical for many purposes if the prompt changes frequently. AWE is suited for giving scores for a large scale of writings, but not for giving detail-personalized feedback in a class with a small number of students.

### C. 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. It is clear that digital ink can replace paper and pencil in teaching, allowing teachers to complete and submit their handwritten feedback digitally in the same way as they have done with paper in the past. Such a handwriting based approach provides a customization of instruction that makes learning more meaningful for each student. In fact, many schools have attempted to introduce such input devices in their lectures or use them to improve students' performance [21]. Also, ref. [22] indicated, "The pen approach suggests more flexibility in teaching and learning." Both quantitative and qualitative data showed that the interactive software used in the pen-enabled environment engaged students 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 like paper, feel like paper, though it is better than paper.

D. Noticing

Studies in the fields of cognitive science [23] and cognitive psychology [24] demonstrated that no learning could take place without input 'noticing'. Researchers in SLA (Second Language Acquisition) [25, 26] have been trying to find methods to attract learners' attention to the target structures. The methods such as, textual enhancement, input flooding and processing instruction were employed by some researchers as a means of guiding students' attention toward the target structures. Textual enhancement, for instance, highlights the forms to be noticed by using bolding, uppercase letters, underlining, shadowing and different fonts. In this study, the handwritten feedback as a kind of enhanced text was used in giving error feedback in students' writings. In addition, this study seeks to determine whether learners find this kind of enhanced feedback effective in attracting attention and improving accuracy than by traditional methods.

Even TBHF looks like PBHF and feel like PBHF, however, we still not clear which feedback students prefer? Which feedback is the most effective instructionally? And which offers the greatest opportunities for second language acquisition?

The goal of this study was to investigate the perceptions and attitudes of learners toward reviewing PBHF and TBHF and to determine whether TBHF used in this study as a good approach in learning L2 writing.

II. PREVIOUS RESEARCH

Prior to the study, the authors designed and developed an online correction supporting system – DInCo (Digital Ink Correction). It was developed using Microsoft Tablet PC SDK [27] and Agilix InfiNotes controls which integrated rich ink note-taking tools including lines, highlights, color, eraser, extend tools, etc. It enables the teachers to handwrite feedback directly in the Internet Explorer in the digital writings supplied online by the students. The handwritten feedback integrated writing could be saved in the server then the students could review the handwritten feedback online anytime and anywhere [28] (see Fig. 1).

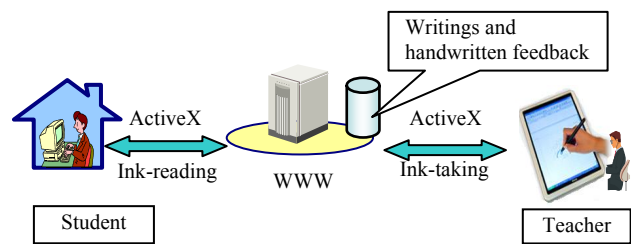


Figure1. The image of distance checking

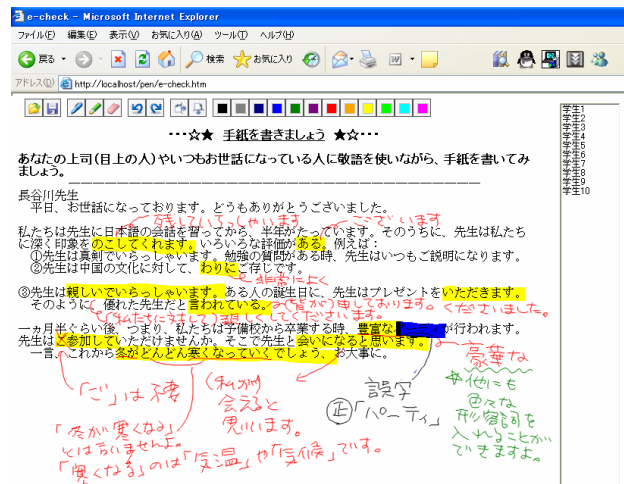
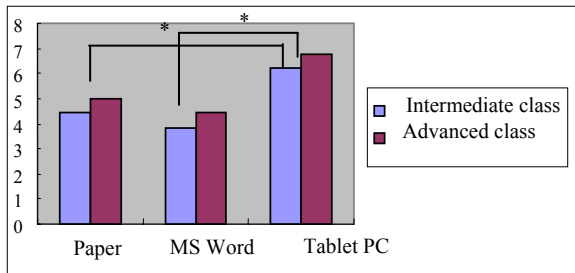


Figure 2. Handwritten feedback based on DInCo

In the pilot study, we conducted a survey using paper, MS Word and DInCo based corrections to compare the effects of the different media on students in terms of language acquisition. The participants of the study were 60 Chinese students who have studied Japanese at a Japanese language school in China. First a Japanese teacher was asked to use different media (paper, MS Word, Tablet PC) to give error feedback to a piece of writing written by a Chinese student using Japanese honorific expressions. Chinese learners always make mistakes with Japanese honorific expressions because the usage of it is different from Chinese culture. Then the students were randomly set into 3 groups (paper, MS Word, Tablet PC) to review the writing corrected by the teacher to learn what errors were there in the writing and to figure out why they were wrong based on the teacher's feedback (see Fig. 2). Then the student was asked to answer a questionnaire about the media he or she had reviewed with previously. At last, a recall test was conducted to test how much the students could recall the teacher's feedback after they review one media based correction.

The results of the recall test indicated that all of the students could correct more errors in the writing after they review the teacher's error feedback. We had also identified that both of the intermediate class and advanced class students who review Tablet PC based feedback made more correct corrections than those who reviewed paper or MS Word based error feedback,  $p < 0.04$ ,  $p < 0.02$  (see Fig. 3).



(\* p<0.05)

Figure 3. Increased number of correct corrections after reviewing the teacher's feedback

A factor analysis of the questionnaire showed that students' responses in the survey could be grouped into four factors, which were: 'Usability of the media', 'Learning motivation', 'Social presence', and 'Effectiveness of the media'. A series of ANOVA test analyses were also conducted to evaluate the differences of the three media among the four factors. As the results, the students considered that Tablet PC has the best usability in comparison to the other two media. Concerning the motivation, presence and effectiveness of the media factors, both paper and Tablet PC have a significant difference on the students than MS. Word. From the survey, we concluded that Tablet PC based feedback have a positive effect on learners' memorization than the other two media. But from the questionnaires we concluded that Tablet PC has the same effects as paper on students' motivation, social presence and effectiveness of media factors (see table1).

TABLE 1: USABILITY, MOTIVATION, PRESENCE AND EFFECTIVENESS AMONG DIFFERENT MEDIA

Media	Usability, (Mean, SD)	Motivation, (Mean, SD)	Presence, (Mean, SD)	Effectiveness (Mean, SD)
Paper	(4.3, 0.73)	(5.5, 1.02)	(5.4, 1.25)	(5.5, 0.83)
MS. Word	(4.2, 0.72)	(4.5, 1.54)	(3.3, 1.63)	(4.6, 1.35)
DInCo	(4.7, 0.60)	(5.6, 1.14)	(5.2, 1.36)	(5.2, 1.16)
F(ANOVA)	7.05	12.27	36.29	11.52
Tukey HSD	□>□*	□>□*	□>□*	□>□*
	□>□*	□>□*	□>□*	□>□*

(\* p < 0.05)

From the questionnaires we found many similarities between paper and Tablet PC based feedback. In order to affirm the similarities between the two styles of feedback, the authors conducted the following survey to compare the effects of the two media based handwritten feedback in detail.

The specific research questions are:

Do learners have generally favorable attitudes toward TBHF?

Do learners have the same perceptions and attitudes toward PBHF and TBHF?"

Do PBHF and TBHF lead to different proficiency improvement after students review the error feedback?

### III. METHOD

#### A. Participants

The participants were 42 Japanese majors at a university in China. Twenty of them were in the second

grade, and twenty-two of them were in the third grade. Most of the participants in the third grade have passed the Level 1 of JLPT (Japanese Language Proficiency Test), and the one in the second grade have not attended the JLPT yet, however, their proficiency of Japanese should be equal to Level 2 of JLPT.

#### B. Materials

In order to compare the learners' perceptions to PBHF and TBHF, we asked a Japanese teacher to give handwritten error feedback to the same writing used in the pilot test on paper (PBHF), and then she was asked to use DInCo to give handwritten feedback to the same writing on a Tablet PC (TBHF). The handwritten feedback was then saved as html file which could be viewed in the Internet Explorer by normal laptop (see Figure 2). The writing with PBHF and TBHF will be used in the following survey.

#### C. Procedure

First, all the participants were asked to do a pre-test with 10 fill-in-the-blank questions about Japanese honorific expressions. They need to complete the sentences with the correct forms of the Japanese honorific expressions provided in parentheses. The pre-test was to measure their mastery of Japanese honorific expressions. Although the participants came from different grades and might have different Japanese proficiency, since the test contents of Japanese honorific expressions were learnt in their second semester, so we assume they have the same proficiency in Japanese honorific expressions. And the assumption will be verified in later analysis. Next, the participants were random set into PBHF and TBHF groups. Each group was given 20 minutes to review the writing corrected by the teacher to figure out why the error were wrong based on the teacher's handwritten error feedback. After reviewing the writing, the students were then asked to answer a questionnaire about their perceptions and attitude toward the corrected writing. Finally, after answering the questionnaire, they took the post-test. The post-test was the same as the pre-test involved with 10 fill-in-the-blank questions about Japanese honorific expressions. The two tests were developed using a counterbalanced design to ensure an equal level of difficulty for the tow test. The post-test was to test whether the teacher's error feedback would lead to a positive effect on students' Japanese proficiency.

In this paper, we evaluated the data obtained from the questionnaires to investigate the learners' perception and attitude to the two media. Also data from the post-test was analyzed to show proficiency improvement after students reviewed different media based handwritten feedback.

## IV. RESULTS

#### A. Analysis of the questionnaire

To investigate the learners' perceptions and attitude of PBHF and TBHF, a questionnaire was developed included three parts: learning motivation section (21 items), media usability section (15 items), and presence section (14 items). All the items used a 5-point Likert scale (1 indicating strongly disagree and 5 strongly agree). The learning motivation section was designed to measure learners' learning motivation based on ARCS model [29]. The usability section was designed based on WAMMI

[30] to measure and track user satisfaction and reactions of the media. And the presence section was based on the work of Gerhard who investigated that the humanoid avatars gave rise to higher levels of presence than basic shape avatars [31].

First, a factor analysis was conducted to categorize the question items in the three sections. In the motivation section, results showed that students' responses could be grouped into 5 factors, which were: 'Attention', 'Importance', 'Relevance', 'Confidence', and 'Satisfaction' (see table 2).

Considering the factor loading, the initial 21 items were reduced to 18 items. The number of items turned out to be 5, 3, 3, 4, 3 items in each of the five factors. The five factors scales accounted for 63.2% of the variance. The reliability (alpha) coefficients for the five factors were 0.342, 0.954, 0.618, 0.783 and 0.614. Therefore, these items seemed to be sufficiently reliable for assessing students' responses.

For example, the 'attention' factor involved the items of "The quality of the writing helped to catch my attention", "The design of the error feedback looks dry and unappealing", and "I learned some things that were surprised or unexpected", etc. The 'Relevance' factor involved the items of "It is clear to me how the content of corrected writing is related to things I already know", "The feedback was not relevant to my needs because I already knew most of them", etc. The 'confidence' factor involved items of "When I first looked at the writing, I had the impression that it would be easy for me", "The corrected writing had so much information that it was hard to pick out and remember the important points", etc. The 'satisfaction' factor included items of 'Completing the writing with handwritten error feedback gave me a satisfying feeling of accomplishment.', 'I really enjoyed studying Japanese', and 'The feedback and comments in writing helped me feel rewarded for my effort', etc.

TABLE 2 MEANS AND STANDARD DEVIATIONS OF FACTORS IN MOTIVATION ITEMS

Factors	M (SD) of PBHF	M (SD) of TBHF
Attention	3.28 (0.41)	3.18 (0.41)
Importance	3.53 (0.41)	3.35 (0.33)
Relevance	4.57 (0.34)	4.30 (0.56)
Confidence	3.52 (0.32)	3.66 (0.34)
Satisfaction	3.78 (0.60)	3.43 (0.89)

(\* p<0.05)

Secondly, the factor analysis showed that the responses in the usability of the media section could be grouped into three factors, which were: 'Attractiveness', 'Visualization', and 'Reliability' (see table 3).

There were respectively 8, 4, 2 items in the three factors. All the factors scales accounted for 61.5% of variance. The reliability (alpha) coefficients for these scales respectively were 0.661, 0.673 and .566. Therefore, these items were also seemed to be sufficiently reliable for assessing students' responses.

In the usability section, the items in the 'Attractiveness' factor included "The handwritten feedback is very attractive", and "The handwritten error feedbacks make impression to me", etc. The 'visualization' factor involved items of 'It is easy to understand how to use the media', 'I can easily understand what the handwritten feedback wrote', etc. The items in 'Reliability' factor included 'the

handwritten feedback is reliable', and 'The contents of error feedback are appropriate'.

TABLE 3 MEANS AND STANDARD DEVIATIONS OF FACTORS IN USABILITY ITEMS

Factors	M (SD) of PBHF	M (SD) of TBHF
Attractiveness	3.75 (0.53)	3.39 (0.60)
Visualization	4.10 (0.78)	3.95 (0.68)
Reliability	3.85 (0.84)	3.82 (0.83)

(\* p<0.05)

At last, the responses in the presence section could be grouped into four factors, which were: 'Immersion', 'Space sense', 'Involvement', and 'Awareness' (see table 4).

There were respectively 6, 3, 4, 2 items in these factors. The four factors scales accounted for 67.6% of variance. The reliability (alpha) coefficients for these scales respectively were 0.876, 0.755, 0.605 and 0.498. Therefore, these scales were seemed to be sufficiently reliable for assessing students' responses.

In the presence section, the 'Immersion' factor involved items of 'I can feel the teacher close to me', 'I can feel the teacher giving error feedback seriously', and 'I found it much easier to communicate with the teacher', etc. The 'Space sense' factor contained items of 'I can feel the teacher spending much time on giving feedback to all the errors' and 'I can get teacher's feedback in short time', etc. The 'involvement' factor contained items of 'I can control the reviewing speed', and 'I care about what the teacher wrote', etc. And 'Awareness' factor contained items of 'I can know who give the feedback', and 'I want to ask more questions after reviewing the error feedback'.

TABLE 4 MEANS AND STANDARD DEVIATIONS OF FACTORS IN PRESENCE ITEMS

Factors	M (SD) of PBHF	M (SD) of TBHF
Immersion	3.96 (0.63) *	3.38 (0.97)
Space sense	4.21 (0.59) *	3.72 (0.89)
Involvement	4.05 (0.50)	3.76 (0.64)
Awareness	3.80 (0.82) *	3.18 (0.83)

(\* p<0.05)

The factor analysis was to categorize the question items in the three sections. To investigate the differences between PBHF and TBHF groups, ANOVA was also conducted to evaluate the difference among these factors between the two groups. In the motivation question section, the results of ANOVA showed that there were no significant differences on the four factors. Also in the usability question section, the results showed that there were no significant differences on the three factors. But there is a difference tendency in 'Attractiveness' factor,  $F(1, 38)=0.003, p=0.054$ , which showed that PBHF group reported a higher attractiveness of the media than TBHF group. By the fact that, the participants in the survey have little IT literacy and showed some anxiety to use laptop, it might make them prefer to use the traditional paper for receiving feedback. In the ANOVA results, we could only found significant differences on 'Immersion' factor ( $F(1,38)=3.85, p=0.033$ ), 'Space sense' factor ( $F(1,38)=0.37, p=0.043$ ), and 'Awareness' factors ( $F(1,38)=0.52, p=.022$ ) in the presence section (see table 4). Among the three factors, PBHF group showed a higher presence perception than TBHF group.

By the fact that the handwritten feedbacks in the two media we used in the survey were similar in appearance,

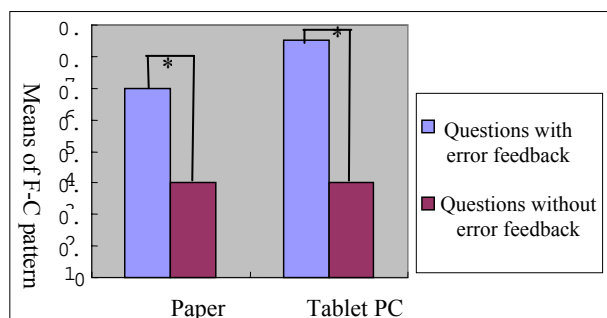
the results showed that the learners have a similar learning motivation and sense of media usability on paper and Tablet PC based handwritten feedback. Only a significant difference on presence factor was found between the two media. The results revealed that the students did not have significant different perceptions on paper and Tablet PC based handwritten feedback when the language teacher just used Tablet PC as a digital ink to give handwritten feedback as what he did on paper. These finds provided supports for our previous research that the students have some similar perceptions on the two media. From the presence factor results, we can conclude that the students have little IT literacy and they are not familiar with Tablet PC which made they fell the computer as a virtual environment that lead to little presence of the teacher than paper did.

### B. Analysis of the outcome

First, a t-test in the pre-test was conducted to the analysis whether PBHF and TBHF groups are different on Japanese honorific expressions proficiency. The result showed that there were no significant different in the test scores between the two groups ( $t=0.17$ ,  $p=0.87$ ). So we are confident that the two groups have the same proficiency in Japanese honorific expressions, which enables us to make further comparison followed.

Altogether, there were 18 error feedbacks in the writing given by the teacher. Although there were 10 questions both in the pre-test and post-test, only 8 pairs have the same grammar questions both in the two tests. Including 5 pair questions that have the same grammar contents as the error feedback in the writing and the other 3 pairs have the same grammar contents but without error feedbacks in the writing. Therefore, in this study, we only considered the F-C (false answer in the pre-test and correct answer in the post-test) pattern in the 8 pair questions, by which we could know whether the error feedback given in writing between the pre-test and post-test could have a positive effect in students' proficiency improvement, and whether the different media based handwritten feedback would have similar effect on their proficiency improvement.

The results showed that the students made significant more F-C answers by the error feedback than the ones without feedback both in paper ( $t=2.35$ ,  $p=.030$ ) and Tablet PC ( $t=2.85$ ,  $p=.010$ ) based feedback (see Fig. 4). The results revealed that the error feedback could help students to improve their accuracy and have a positive effect on their language proficiency in short term.



(\*  $p < 0.05$ )

**Figure 4** A comparisons on F-C pattern between with or without error feedback basing on paper and Tablet PC

But no significant difference was found in the F-C pattern with error feedback between the two media ( $t=0.76$ ,  $p=0.45$ ). This result revealed that the handwritten feedback based on the two media have the same effect on students' language proficiency improvement.

## V. DISCUSSION

The purpose of this study was to examine learners' perception toward two styles of handwritten feedback and evaluate the effect on their proficiency improvement.

Firstly, the factor analysis results showed that the learners have a slight sense of attention ( $M=3.18$ ,  $SD=0.41$ ) and satisfaction ( $M=3.43$ ,  $SD=0.89$ ) when reviewing TBHF. And the ANOVA results showed a difference tendency in the 'Attractiveness' factor,  $F(1, 38)=0.003$ ,  $p=0.054$ , which showed that PBHF group reported a higher level of attractiveness than TBHF group. From the interview and answers of the open-end question, we found that the participants have never used computer in learning Japanese writing, and they have little acknowledges of Tablet PC. Even we have explained and showed them how the teacher given handwritten feedback on Tablet PC before the survey, some of them still did not understand the differences between Tablet PC and laptop. Moreover, most of the participants said that the screen of the laptop was too small to review TBHF, and their eyes were tired when reviewing TBHF on the laptop which might affect the study. The results suggested that Tablet PC was still a new technology in second language learning, learners and teachers need more time to get familiar with the new feedback method.

Secondly, the ANOVA results showed significant differences in 'Immersion', 'Space sense' and 'Awareness' factors in the presence question section between TBHF and PBHF. It revealed that the learners felt the handwriting on a Tablet PC as a virtual learning environment that they were difficult to feel the presence of the teacher. On the contrary, PBHF which they always used in learning writing could give them strong feeling of teacher's presence.

## VI. LIMITATIONS OF THE STUDY

There are a number of factors that limit the generalization of the present study. Firstly, the sample size in the pair questions is too small that only involved 5 questions with feedback and 3 questions without feedback both in the pre-test and post-test. This limits the statistical power available to detect differences. With a larger sample, more differences between two media based handwritten feedback might have been found.

Secondly, since it was the first time for the teacher to handwrite feedback on a Tablet PC and she wasn't familiar with writing directly on the screen, the handwriting style on Tablet PC was not the same as her personalized writing style wrote on paper. Also, the unclear handwritten feedback on Tablet PC may affect students' perceptions to the survey.

Thirdly, the teacher just used only one color in giving feedback on Tablet PC which she used the same color in giving feedback on paper. This may result in a similar perception on the two media. However in our previous research, the teacher used different colors to indicate different kinds of errors which made students thought the feedback on table PC was more attractive than paper.

When the teacher could take full advantage of rich ink note-taking tools on Tablet PC, the students might have different perceptions on TBHF.

Another limitation was that, the study was only conducted in a short term. Thus, the obtained data could only represent the students' snapshot perceptions and their short-term memory changes. And since all of the participants reviewed TBHF for the first time, their anxiety to the media could affect the results of the study too.

## VII. CONCLUSION

In this study, we compared learners' perceptions in the PBHF and TBHF. The results indicated that there was little difference on motivation and usability of media factors. However, PBHF showed a positive effect on presence factor than TBHF. Also, there was little different proficiency improvement after students reviewed different media based handwritten feedback. The results suggested that when using Tablet PC in giving feedback, the teacher should not use the table PC just as a digital pen to do exactly what they did with paper. We suggest that they should use Tablet PC in an innovative way to improve their writing instruction and enhance learners' writing proficiency.

Considering all these limitations, further studies are needed that will focus on a long term period study to evaluate students' perceptions and proficiency improvement. Moreover, according to multimedia information could enhance learners' learning motivation and promote knowledge acquisition [32], the unique functions of Tablet PC and merits of the Internet should also be combined to give more meaningful handwritten feedback, for example: using rich note-taking tools, dynamically recording and playback both teacher's oral explanation and writing processes when they give feedback to students' writings.

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