The Effectiveness of Adopting E-Readers to Facilitate EFL Students’ Process-Based Academic Writing

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ABSTRACT

English as Foreign Language (EFL) students face additional difficulties for academic writing largely due to their level of language competency. An appropriate structural process of writing can help students develop their academic writing skills. This study explored the use of the e-readers to facilitate EFL students’ process-based academic writing. The experiment was conducted in the graduate level class entitled “Technical and Scientific English Writing” in a northern Taiwan university for the entire semester, about 5 months. Students’ perceptions, writing outcome and portfolio were collected and were later evaluated. Both qualitative and quantitative approaches were adopted in this study. Empirical data were collected and analyzed to report on the performance of EFL students’ academic writing with and without the e-readers. Findings indicate that e-readers affected the process of reading, annotation, and information retrieval with the unique functions. For EFL students’ academic writing, e-reader can be a tool for reciprocal peer review that aided academic writing. Moreover, e-readers are significantly beneficial for students’ academic writing progress compared to the conventional paper-based materials. The functions of e-readers can assist students’ writing process and make the recursive circle of steps more efficiently. E-readers could afford creating a better writing environment in the process-based writing approach. This study further discussed the role of e-readers in the academic writing classroom and further discusses how to use e-readers to facilitate academic writing in the classroom.

Keywords

E-reader, Academic writing, English as Foreign Language (EFL), Process-based writing

Introduction

The English language has been increasingly highlighted as an important medium of communication in academia between English native speakers and non-native speakers (Leki, 2001; Zhu, 2004). However, academic writing is different for these two populations (Silva, 1993). English as Foreign Language (EFL) students face additional difficulties and stress for academic writing largely due to their level of language competency (Al Fadda, 2012; Bacha, 2002; Olivas & Li, 2006). To deal with the extra cognitive burden that EFL students are likely to experience for academic writing, an appropriate structural process of writing can help students develop their academic writing skills (Bacha, 2002). The writing process approach is a non-linear activity in which students need to go recursively through steps of planning, drafting, revising, editing, and publishing. It emphasizes on the continual interactions with the instructor and peers during the writing process (Greene, 2000; Tribble, 2002). Several studies have proposed a process-based writing instruction and the need for a supplementary tool for EFL students has been justified (Arslan & Şahin-Kizil, 2010; Shang, 2007; Wang, Shang, & Briody, 2013). Meanwhile, the advancements of technology have led to the use of electronic reading systems for digital contents (Wright, Fugett, & Caputa, 2013). An electronic device such as the e-reader has the potential for aiding students in the process of writing. E-readers are generally portable and contain a built-in dictionary, and also tools for annotation and information browsing. However, few studies have examined the effect of adopting e-readers as an aiding device in academic writing for EFL students.

The aim of this study was to investigate the role of e-readers and how e-readers facilitated academic writing of EFL students. The following research questions guided this study:

- Can e-readers make any differences to EFL students’ writing performance, including writing outcome and portfolio, with or without the adoption of e-readers?
- What are the instructor and students’ perceptions on e-readers in the academic writing classroom?
- Can e-readers facilitate EFL students’ academic writing in a process-based approach? If yes, how do students use e-readers during the academic writing process?
- What are the roles of e-readers in the academic writing classroom?
Literature

Process-based writing and peer assessment

The process-based approach to writing or process writing has gained considerable attention and support from educators (Bacha, 2002). During process writing, writers are asked to repeatedly revise the drafts and this recursiveness is the main characteristic of the approach (Murray, 1978; Perl, 1980; Li, 1992). Given the difficulties of academic writing for EFL students, they need to have an appropriate structural approach in academic writing. The writing process used in this study was composed of six steps: (1) Prewriting, (2) Outlining, (3) Drafting, (4) Revising, (5) Editing and (6) Publishing (Otłowski, 1998).

Among the resources that writers can obtain during the writing process, feedback from teacher and peers is central, especially in a second language or foreign language setting because it promotes the sense of an audience in the students and sensitizes them to the needs of readers (Arslan & Şahin-Kızıl, 2010; Liu & Sadler, 2003). A number of studies have demonstrated the benefits of peer assessment on developing writing skills. Peer assessments are often conducted in peer response groups or through peer editing (Ferris, Brown, Liu, & Stine, 2011; Leki, 2001). It is also used with EFL classes (Liu & Hansen, 2002; Paulus, 1999; Villamil & de Guerrero, 1998). Peer assessment can be carried out when in the developing stage rather than at the end. It can also be conducted more frequently and immediately than teacher assessment. By interacting with peers and assessing the works of others, students themselves can also improve their self-assessment skills (Towler & Broadfoot, 1992). Although peer assessment can be less reliable and valid than that of the teacher’s assessment, especially when the assessors are young or inexperienced learners, peer feedback has the advantage of being available in greater volume and with greater immediacy than teacher feedback. Therefore, to implement process writing successfully, teacher’s supervision is essential to increase the reliability and validity of peer assessment (Topping & Ehly, 2001) and both the teacher feedback and peer feedback need to be integrated into the writing course (DiGiovanni & Nagaswami, 2001; Arslan & Şahin-Kızıl, 2010).

Technologies supporting students’ writing development

The advancement of the technologies has increased the opportunities of writing and made editing easier for students. More and more students engaging in creating and sharing digital content on the Internet have resulted in the participatory culture which shift the focus of literacy from individual expression to community involvement (Clinton, Purushotma, Robison, & Weigel, 2009). In the participatory culture, collective intelligence is one of the new literacies involved social skills through collaboration and networking (Clinton et al., 2009). Schäfer (2011) further defined the explicit participation which focused on active engagement of users in creative processes. The success of web technologies thrives on participation culture. An example is the online writing platform, the interactive features of Course/learning management system (CMS). The CMS provides a place where a student can share his writing with all the other students and the teacher can review and rate students’ works. The features that students indicated contributed the most to their learning, including sharing materials with peer learners, teacher’s feedback on assignments and online readings (Kvavik, 2005). Furthermore, studies indicate that students consider handheld devices useful and effective for reading and writing activities (Paredes, Sanchez-Villalon, Ortega, & Velazquez-Iturbide, 2007; Samuels, 2005).

Van Lehn, Chi, Baggett, & Murray (1995) suggested that peer assessment demands cognitive activities such as reviewing, summarising, clarifying, giving feedback, diagnosing errors and identifying missing knowledge or deviations from the ideal. In peer assessment, students have more opportunities to view assignments of peers. Kwok & Ma (1999) used the group support system to support collaborative assessment and found that online collaborative annotations can improve both learning achievement and motivation. However, previous works have mainly focused on collaboratively annotating electronic materials or documents (Lin & Lai, 2013; Su, Yang, Hwang, & Zhang, 2010; Yang, Chen, & Shao, 2004; Yeh & Lo, 2009). Adopting e-readers to facilitate students’ collaborative annotations in the process-based academic writing is scarce.
E-readers in the classroom

Various studies have examined the use of mobile technology to facilitate indoor or outdoor learning to provide learners and educators with support that is more active and more adequate (Cavus & Ibrahim, 2009; Chen, Kao, & Sheu, 2003; Hung, Hwang, Lin, Wu, & Su, 2013; Wang, Young, & Jang, 2013). Previous studies have shown that mobile devices, such as PDAs, Tablets or smartphones, can be used as a cognitive tool to efficiently provide information and feedback relevant to the current learning situation (Hung & Young, 2013, Hwang, Chu, Lin, & Tsai, 2011; Vogel, Spikol, Kurti, & Milrad, 2010). Mobile learning has been recognized as being an effective learning approach (Chu, Hwang, Tsai, & Tseng, 2010; Rogers & Price, 2009). However, few studies have discussed the adoption of e-readers in the high education.

E-readers are portable electronic devices designed for reading digital books and electronic documents, such as the Amazon Kindle, the Sony Book Reader and the B&N NOOK. Devices such as e-readers and portable e-book reading devices have been introduced into the market with increasing growth of sales and have brought a considerable amount of research issues (Wilson, 2003, Pappas, 2009; Harris, 2010). Several researchers (Dearley & McKnight, 2001; Schoolnik, 2002; Thayer et al., 2011; Waller, 1986; Wilson, 2003) have developed e-reader prototypes and assessment methodologies to resolve the usability and interface issues in language classrooms. Many studies on e-book have focused primarily on reading digital content on a computer (Chang, 2005; Chao, Chen, & Chang, 2010; Chen, Guimbretiere, Dixon, Lewis, & Agrawala, 2008; Chou, 2012; Huang, 2013; Lin, 2009; Oakley & Jay, 2008; Sun, 2003). Borgman (2007) argues that the continued use of printed books and journals contributed to the slow adoption of E-readers in academia than in the general public. Moreover, studies indicated that it is time-consuming to convert the current learning materials to electronic forms for e-readers (Marmarelli & Ringle, 2009; Rae, 2011; Young & Lin, 2012).

Wright et al. (2013) compared the vocabulary and reading comprehension of students who used e-readers and paper-based books. It was found that although students do not differ in their language comprehension, they are more likely to search for extra information when engaged with digital text. Nevertheless, several pilot studies integrated e-readers in an academic setting in BOTH UK and US found that the checking, bookmarking, highlighting, and annotation functions were in high demand for the students (Behler, 2009; Simon, 2001; The Trustees of Princeton University, 2010; Wilson, 2003). However, it is still unclear whether or how e-readers can be integrated into classrooms to become a useful learning device for EFL learners. It is one of the issues worthy of our investigation.

Method

To investigate the effects of using e-readers in an EFL process-based academic writing class, this study was conducted in a graduate writing class entitled “Technical and Scientific English Writing” in a northern Taiwan university. This was a 5-month class, running for an entire semester. Students’ perceptions, writing outcome and portfolio were collected and were later evaluated. Both qualitative and quantitative approaches were adopted in this study. Empirical data were collected and analyzed to report on the performance of EFL students’ academic writing with and without the e-reader. Triangulation was used to improve reliability of the study.

Participants

“Technical and Scientific English Writing” course was lectured for the academic purpose writing. Based on the heavy burden of the teacher need to correct and comment on every EFL students’ writing, this course is usually limited to about 20-25 students. This study was conducted in a natural setting. Twenty-three graduate students enrolled in this course and were divided into the experimental group which used e-readers (EG, n = 12) and the control group which used the conventional textbooks (CG, n = 11) to learn the same content. These graduate students with diverse backgrounds enrolled in this course for the purpose of improving their academic writing and to publish their papers as journal articles. The students had achieved an intermediate level of proficiency because they had studied English for at least 7 years. None of them reported having prior experiences of using e-readers. The instructor had been teaching the course for five years and wanted to take this opportunity to explore the potentials of e-readers and to ease the burden in teaching and reviewing students’ writing.
About the e-readers

The e-readers used in this study were manufactured by a company in Taiwan which has been well-known for manufacturing green products to provide innovative, clean and energy-efficient solutions for environment conservation. The e-reader is a 13.1-inch color touch display, with low power consumption, wireless connectivity, USB 2.0 slot, memory card slot, handwriting recognition function and weights about 750g. The e-readers provide the functions to assist students’ listening and note-taking in lecture, textbook reading and information searching.

Setting

During the study, students in the EG used e-readers as their personal learning devices both in the class and after school (Figure 1). Learning materials were transformed to a digital version to be used on the e-readers. Moreover, the Learning Management System (LMS) was implemented for students to exchange their annotation and review comments through the e-readers. Students in the CG received identical contents in paper prints. In this course, students needed to complete the write-up of a research paper, which includes the introduction, method and results sections. The six steps of the process-based writing (Otlowski, 1998), including prewriting, outlining, drafting, revising, editing, and publishing steps were carried out in this course for all students. To implement the writing process successfully, both the teacher feedback and peer feedback need to be integrated into the writing course. Students were asked to form small groups of three or four to assess each other. Peer assessment was conducted recursively among the drafting, revising and editing steps (Figure 2). Moreover, students had to hand in a portfolio which is a reflection of their writing progress every four weeks. At the end of the course, each student was required to submit their academic paper as the final report.

Data collection and analysis

Both quantitative and qualitative data were collected in this study. Students’ learning performance was evaluated based on their writing outcome and writing portfolio. The writing outcome included the grades on four writing assignments – the introduction, method, results and a complete research paper. The writing portfolio was a self-evaluation report on writing progress that each student had to hand in every four weeks. The instructor would grade each student’s writing outcome and portfolio. To understand the writing performance, this study collected the students’ grades for assignments and reports. A questionnaire was administered at the end of the semester to explore
students’ perceptions on the usability of e-readers and the effects on learning. The questionnaire consisted of 46 questions on a five-point Likert scale. The first part of the questionnaire contained 26 questions on system usability, which were adopted from Lund’s USE Questionnaire (Lund, 2001) and translated into Chinese by the researchers. The second part of the questionnaire were 20 questions on perceptions of e-readers’ functionality devised by the researchers, also on a five-point Likert scale. The third part of the questionnaire consisted of open-ended questions on the advantages and disadvantages of e-readers, how students used e-readers to enhance their academic writing and their suggestions if any. In addition, both individual and focus group interviews were conducted.

The scores of writing outcome, portfolio and questionnaire were computed and analyzed with the SPSS 12.0 statistical software package, and the related descriptive statistics were also computed. Independent-samples t test was used to detect significant difference among variables. To assess the validity of the questionnaire, this study determined the associations between the questionnaire scores by factor analysis. The results of factor analysis (\( \chi^2 = 5148.462, df = 990, p = 0.0000.001 \) ) indicates the construct validity of the questionnaire was satisfactory. Moreover, the internal consistency and reliability were tested by means of the Cronbach’s alpha coefficient, and the result for the sample as a whole was 0.94 (for the various domains, the coefficient ranged from 0.85 to 0.91), indicating that the questionnaire was acceptable with adequate internal consistency and reliability.

Interviewing is one of the most powerful tools to understand our fellow humans (Fontana & Frey, 2008). Therefore, this research utilized a qualitative approach that focused on understanding of the participants’ feelings, experiences and perceptions in relation to using e-readers to assist writing. All participants were interviewed at the middle and the end of the semester. Moreover, students’ activities during the class were video recorded and observations were made to participants’ behavior of using e-readers to assist writing. The data was analyzed thematically following a qualitative approach (Vaughan, Schumm, & Sinagub, 1996). The observations and interviews were transcribed verbally and then coded and reduced by searching specifically themes, including peer interaction, interaction with e-readers, the reflections and attitude toward using e-readers to assist writing in class. Further data was gathered by recorded interviews with four individual teachers, from two partnerships, one in the primary sector and one in the secondary sector. This data was also analyzed thematically using the same technique.

### Results and findings

#### Learning performance of experiment group (EG) and control group (CG)

To respond to the first question, students’ learning performance was measured by grades on writing outcome and writing portfolio. Independent T-test was used to examine the effects of the two teaching approaches (with or without e-readers) in terms of writing outcome and writing portfolio.

<table>
<thead>
<tr>
<th>Source</th>
<th>Mean</th>
<th>SD</th>
<th>DF</th>
<th>t value</th>
<th>F value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing outcome</td>
<td>EG (n = 12)</td>
<td>80.06</td>
<td>5.56</td>
<td>21</td>
<td>.697</td>
<td>1.678</td>
</tr>
<tr>
<td>(four assignments)</td>
<td>CG (n = 11)</td>
<td>77.16</td>
<td>13.23</td>
<td>21</td>
<td>.209</td>
<td>.001</td>
</tr>
<tr>
<td>Writing Portfolio</td>
<td>EG (n = 12)</td>
<td>89.50</td>
<td>2.37</td>
<td>21</td>
<td>.788</td>
<td>0.299</td>
</tr>
<tr>
<td>(four self-reports)</td>
<td>CG (n = 11)</td>
<td>87.95</td>
<td>6.38</td>
<td>21</td>
<td>.209</td>
<td>.001</td>
</tr>
</tbody>
</table>

*Note. p < .05. EG: experiment group; CG: control group.*

To examine the writing outcome, the independent T-test was applied to analyze the grades of three assignments and the term paper. Results in Table 1 indicate that the learning achievement of students in EG is higher than CG. However, this difference was not statistically significant (\( t = .697, p = .209 > .05 \)).

<table>
<thead>
<tr>
<th>Source</th>
<th>Mean</th>
<th>SD</th>
<th>DF</th>
<th>t value</th>
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<th>Significance</th>
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<td>21</td>
<td>.209</td>
<td>.001</td>
</tr>
</tbody>
</table>

*Note. p < .05. EG: experiment group; CG: control group.*

With regard to the learning process, the independent T-test was applied to analyze average grades of students’ portfolios. Results in Table 2 indicate that the score of EG is higher than CG and this difference is statistically significant (\( t = .788, p = .032 < .05 \)).
It can be said that although there was no difference on writing outcome between the two groups, students who adopted e-readers showed stronger engagement compared to students who were given printed materials. The adoption of e-readers was beneficial to the students’ writing process.

**Students’ perceptions of the role of e-readers in the academic writing classroom**

Following the second research question, the researchers analyzed the questionnaire and students’ responses during the interview to explore students’ perceptions of the role of e-readers in an academic writing classroom. As shown in Table 3, students’ perceptions with regard to e-readers were positive. The usefulness, ease of learning, and the functionality were rated above 4.20, and the ease of use and satisfaction were rated above 3.88. These results indicate that the students’ perception about the e-readers were positive. Moreover, the lecturer and students’ feedback during the interview also showed this tendency.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usefulness</td>
<td>4.20</td>
<td>0.87</td>
</tr>
<tr>
<td>Ease of use</td>
<td>3.46</td>
<td>0.52</td>
</tr>
<tr>
<td>Ease of learning</td>
<td>4.25</td>
<td>0.97</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>3.88</td>
<td>0.76</td>
</tr>
<tr>
<td>Functionality</td>
<td>4.30</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Note. From 5 to 1 points mean strongly agree, agree, neutral, disagree, and strongly disagree.*

During the interview, students emphasized that the e-reader was very easy to carry around, comfortable to read with, and easy to use (E1aFCh; E4aMWe; E1bFLi; E3bMER; E3aMJJe; E1cFAm). With regard to the advantages, students mentioned that e-readers are very convenient for learning (E1cFAm; E4cFLi; E2aFEI; E4bFGI) and many students found it enjoyable (E2aFEI; E4bFGI; E1bFLi; E4aMWe). Several students also expressed their interests in this innovative approach. One of the students (E2aFEI) stated that, “This is a totally different way to learn English. It’s so great to use this device (e-reader) in the classroom. I was able to negotiate with my group members and control the writing process.” Moreover, some encouraging findings from the students were found. Students explained that they feel the review and revision process is very efficient using the e-readers. Students said that, “The annotation function of the e-readers helps keep tracks of the comments from my classmates and based on the records I could revise my paper almost without omission (E1aFCh; E2bMAR; E4cFLi; E1cFAm).” Another student stated that, “Revising paper was very hard for me, but I still felt great when I contributed something to my classmates’ papers. I really prefer to use e-readers as an aid in the writing process (E2cFGI; E1aFCh; E2aFEI; E3aMJJe; E4cFLi).” In spite of the advantages mentioned above, student also suggested that e-readers should provide more Chinese input methods (E4bFGI; E1cFAm). Besides, they were also concerned if the e-readers are easily damaged (E4aMWe; E2bMAR).

To acquire more feedback on the effect of adopting e-readers into the academic writing, this study interviewed the course instructor and two teaching assistants. The instructor was positive about the innovative approach. She stated that, “In the beginning, I was wondering if the use of e-readers would make any positive effect on students. However, I found that the students were active and positive about learning academic writing in the classroom.” The instructor also mentioned that e-readers were useful not only because they can involve a variety of learning materials and also, at the same time keep a record of writing process, such as the portfolio. The instructor expressed, “I think the most important function of the e-reader is that it integrates all the learning materials into just one device. Moreover, all reports, homework, and lecture notes for the whole semester can be saved in this device as a collection. The e-reader provides students with a medium to record and manage the evidence of their learning digitally such as their learning and writing portfolio.” The instructor further stated that e-readers are especially helpful for students’ reading comprehension. “E-reader is a helpful tool in assisting students with listening and note taking during the lectures. Moreover, it also provides students access to resources such as dictionaries, related papers, writing handbook and textbook while they write.”
Functions of e-readers facilitating EFL students’ process-based academic writing

The questionnaire and the interview with students indicated that they used the functions of e-readers to facilitate their writing very often during the writing process (Table 4). For each step of the academic writing process, students might use different functions. The functions that students rated most needed for their writing were annotation (free hand style), dictionary, web browsing and switching between files. These functions were deemed useful and beneficial to their academic writing. Moreover, this study interview with students to further understand how students use these function.

Table 4. Adoption of e-reader into process-based academic writing

<table>
<thead>
<tr>
<th>Functionality of e-readers</th>
<th>Step of the process</th>
<th>Prewriting</th>
<th>Outlining</th>
<th>Drafting</th>
<th>Revising</th>
<th>Editing</th>
<th>Publishing</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Web browsing</td>
<td></td>
<td>4.83</td>
<td>4.75</td>
<td>4.08</td>
<td>4.25</td>
<td>4.25</td>
<td>-</td>
<td>4.43</td>
</tr>
<tr>
<td>File transferring</td>
<td></td>
<td>3.83</td>
<td>3.83</td>
<td>3.67</td>
<td>3.83</td>
<td>4.00</td>
<td>4.25</td>
<td>3.90</td>
</tr>
<tr>
<td>Annotating Sharing</td>
<td></td>
<td>-</td>
<td>-</td>
<td>3.33</td>
<td>4.25</td>
<td>4.50</td>
<td>-</td>
<td>4.03</td>
</tr>
<tr>
<td>Annotation</td>
<td></td>
<td>3.75</td>
<td>4.08</td>
<td>4.08</td>
<td>4.33</td>
<td>4.33</td>
<td>-</td>
<td>4.11</td>
</tr>
<tr>
<td>Highlight</td>
<td></td>
<td>4.08</td>
<td>3.89</td>
<td>3.75</td>
<td>4.33</td>
<td>3.92</td>
<td>-</td>
<td>3.99</td>
</tr>
<tr>
<td>Text</td>
<td></td>
<td>4.33</td>
<td>4.42</td>
<td>4.75</td>
<td>3.92</td>
<td>3.33</td>
<td>-</td>
<td>4.15</td>
</tr>
<tr>
<td>free hand</td>
<td></td>
<td>4.50</td>
<td>4.92</td>
<td>4.67</td>
<td>4.67</td>
<td>4.25</td>
<td>-</td>
<td>4.60</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>4.42</td>
<td>4.50</td>
<td>4.75</td>
<td>4.33</td>
<td>4.50</td>
<td>-</td>
<td>4.50</td>
</tr>
<tr>
<td>Dictionary</td>
<td></td>
<td>4.75</td>
<td>4.33</td>
<td>4.25</td>
<td>3.83</td>
<td>3.75</td>
<td>-</td>
<td>4.30</td>
</tr>
<tr>
<td>Switching between files</td>
<td></td>
<td>4.33</td>
<td>4.08</td>
<td>3.75</td>
<td>3.92</td>
<td>3.83</td>
<td>-</td>
<td>3.98</td>
</tr>
</tbody>
</table>

Note. 1 = never; 2 = rarely; 3 = sometimes; 4 = often; 5 = very often.

Regarding the annotation function, students mentioned their favor. “There are several different ways of annotation in this e-reader and the free hand function is my favorite (E3aMJe).” “Using free hand function can draw my idea easily and quickly (E2cFCi).”

Regarding the dictionary function, students mentioned that “I need to use the dictionary very often to check the definition of the word (E1bFLi; E2bMAr; E4cFLi).” “Because English is not my native language, the dictionary in the e-reader is very useful for me (E2aFEl; E3aMJe).”

Regarding the web browsing function, students mentioned about “I always search the answer from the Internet, especially when I need to check the definition of a word or the grammar for a sentence (E1aFCh).” “It’s important that I can access the Internet during or after class, so I can share my note for each class (E1bFLi).” “It’s easy to download the lecture slides and handouts through the Internet so I can access the materials at any time instead of being limited to where my computer is (E1aFCh; E1bFLi; E3aMJe).”

Regarding the switching between files function, students mentioned about “In the process of writing paper, I need to check the other references frequently; the design of switch reading between different files is very important (E1bFLi, E2aFEI).” “It is often necessary to switch from one to another. That can be done more easily using e-reader to meet my need. Moreover, the device can contain lots of article and easily to search (E4bFGl; E1cFAm).”

Regarding the other functions of e-readers, students mentioned about “It’s easy to carry and much lighter than the text book.” (E1bFLi). “The e-reader surprised me for its long battery life; (E2aFEI) I can use it for the course in the afternoon and continue using it for my homework during the evening without recharging.” “Its power is enough for the reading for a whole day.”

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Role of e-readers in the steps of process-based academic writing

Qualitative data collected form interview and observation indicated that student utilized e-readers intensely and extensively in each step of the academic writing process to brainstorm, outline writing structure, compose and edit their drafts before publishing the final text (Table 5). As found in the interview data, participants illustrated their points by relating their own experiences during the six steps of the writing process.

In the prewriting step, students can identify the audience, purpose and related materials of this article via e-reader. They mentioned that “I like to search and collect the related information (E2bMAR; E4cFLi; E3aMJe).” “The web browsing tool in the e-reader is very useful for me to search and update the most recent academic materials. The articles from the Internet are displayed well on the screen of the e-reader (E1bFLi; E2bMAR).” “When I prepare the materials for my writing, I search the related content from the Internet via the e-readers. That is important for me to do that via the e-reader, because I focused on the content on the e-reader more intently than on the computer (E2aFEI).” Moreover, students mentioned that they use annotation function of e-reader to highlight the key points on the literature they searched. “Instead of printing on paper, I like to read related literature in the digital format on the e-reader for easily archiving and searching them later. (E1bFLi; E2bMAR; E3aMJe; E4cFLi)”

In the outlining step, students created the structure of the composition using the annotation tool of the e-readers. They mentioned that “When I barnstormed for the outline of the article, e-reader is the idea tool to writing down the ideas I generated (E1aFCh; E1bFLi; E3aMJe).” They preferred different types of annotations to outline their article. “I like to add notes via the virtual on-screen keyboard of the e-reader for outlining my article (E1aFCh; E1cFAm; E2aFEI; E3aMJe).” “I like to use free hand annotation function to drawing and writing the outline because it’s casual for me (E1bFLi; E2bMAR; E2cFCi; E4bFGl; E4cFLi).”

In the drafting step, students organized notes according to the outline on the e-readers and drafted their article with the word processor software on their personal computer. They mentioned that “When I compose the ideas according to the outline and start to draft my composition with my computer, the e-reader is the supplementary tool to show the outline and idea in previous steps (E1bFLi; E2cFCi; E3aMJe; E3bMER; E4aMWe; E4cFLi).” Some of them further indicated that “Drafting my article on the computer and referring to the literature and outline on the e-reader is very convenient and efficient (E2cFCi; E4aMWe; E4cFLi).”

In the step of revising and editing, students shared their writing with peers through the Learning Management System and revised their articles follow comments and suggestions of peer and the instructor. Among the two steps and the previous drafting step, peer assessment was conducted recursively and students shared comments through e-readers. They mentioned that “By using E-readers, classmates and I can exchange the annotation and drafts more easily (E1aFCh; E1bFLi; E2cFCi; E3aMJe; E4cFLi).” “I can receive the feedback from peers immediately from the e-reader (E2cFCi; E4aMWe).” Students also indicate that “Follow the comment from the peers I can editing and revising my writing efficiently on the computer (E1aFCh; E2aFEI; E2cFCi; E3aMJe; E3bMER; E4aMWe).”

<table>
<thead>
<tr>
<th>Step</th>
<th>Purpose &amp; Process</th>
<th>Adoption of e-readers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prewriting</td>
<td>Identify the audience and purpose</td>
<td>Internet access</td>
</tr>
<tr>
<td></td>
<td>Brainstorm (within a group or on his/her own)</td>
<td>Annotation (highlight, underline)</td>
</tr>
<tr>
<td></td>
<td>Search related information</td>
<td>File upload to LMS</td>
</tr>
<tr>
<td>2. Outlining</td>
<td>Design layout</td>
<td>Annotation (text, free hand)</td>
</tr>
<tr>
<td></td>
<td>Create the structure of the composition</td>
<td></td>
</tr>
<tr>
<td>3. Drafting</td>
<td>Organize notes and ideas according to the outline</td>
<td>Word processor (pc)</td>
</tr>
<tr>
<td></td>
<td>Compose the ideas according to the outline</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Follow the outline and draft</td>
<td></td>
</tr>
<tr>
<td>4. Revising</td>
<td>Revise basic structure</td>
<td>Annotation (text, free hand)</td>
</tr>
<tr>
<td></td>
<td>Add or delete sections</td>
<td>File upload to LMS</td>
</tr>
<tr>
<td></td>
<td>Share with peers (in the group) and the instructor</td>
<td>Sharing of annotated files with peers and instructors</td>
</tr>
<tr>
<td></td>
<td>Revise the content based on peers’ and the instructor’s comments</td>
<td></td>
</tr>
<tr>
<td>5. Editing</td>
<td>Check for logical theme development</td>
<td>Sharing of the e-reader to LMS</td>
</tr>
</tbody>
</table>

Table 5. Adoption of e-readers in process-based writing
Discussion

The differences of EFL students’ writing process with or without the adoption of e-readers

Although there was no difference in writing outcome between the two groups, students who adopted e-readers showed better performance in writing portfolio than those who were given printed materials. This study further examines why the adoption of e-readers was beneficial to the students’ writing process. The qualitative data collected from our interviews with students indicates that the supplementary use of e-readers makes students review, summarize, give feedback, and identify errors more easily, which are necessary in writing process (Van et al., 1995). Compared with the control group, the experiment group indicates that the e-readers are helpful for sharing materials and feedback with peers immediately. The results indicate that students consider handheld devices are useful and effective for reading and writing activities, which support relevant findings of the studies (Paredes et al., 2007; Samuels, 2005). For teachers, the peer feedback in the experiment group has the strength of being available in greater volume and immediacy than those in the control group. With the aid of e-readers, students can compare notes and comments through interpretations with others easily. The adoption of e-readers might lead students an active engagement in the writing processes resulting in the development of collective intelligence (Clinton et al., 2009) and thrive the explicit participation (Schäfer, 2011).

This study further discusses the web browsing and literature search function using e-readers, and how they affect academic writing process of EFL students. We want to explore how the functions of the learning devices could be appropriately used to facilitate academic writing. It was noticed that the information browsing, highlighting, and annotation functions were in high demand for the students in research writing, which further strengthen studies of integrated e-readers in academic settings in UK and US (Simon, 2001; Wilson, 2003; Behler, 2009; The Trustees of Princeton University, 2010). In addition, this study noticed that EFL students relied heavily on the Internet at each step of the process-based writing. For these graduate students, the Internet provides references and related literature, which can be used to help them outline their own writing, and online dictionaries provide language resources such as grammar and spelling that can be used for self-checking. The Internet accessibility of e-readers is often limited to e-book downloads in the current e-readers market. Considering graduate EFL students’ needs, we thus emphasize that the importance of the Internet accessibility is far greater than manufactures assumed, because it provides students with access to abundant research resources as powerful writing tools.

E-readers affording a better academic writing environment

E-readers have many advantages over printed textbooks because of the significant functions such as information browsing, key-words searching, annotating, and access to the Internet. Therefore, based on the results from the observations, interviews and questionnaire, we conclude that e-readers could afford creating a better writing environment in the process-based writing approach (Figure 3). This study further examines the potentials and the roles that e-readers play in facilitating EFL students in academic writing from the aspects of an individual, peers, and teachers:

For individual

E-readers are the personalized portable library that affords access to different kinds of references and materials. Moreover, e-readers also support the Internet access to search online dictionary, Wikipedia to check the grammar or vocabulary. In the information explosion age, there is a rising call for information management, especially for the EFL students who write technical articles. They need more immediate reference books and writing guidelines to support their academic writings. E-readers, a flexible and effective device to manage content, become more and more powerful and important.
Moreover, e-readers are the annotating tools with a rotatable paper-like screen. The vertical display provides a full-view of an academic paper as if it seems to be on an A4 paper, which makes reading on the screen as comfortable as on papers. Not only can the device be used to read but also to write on and annotate with highlights, underlines and different text colors. Thus saving and revising articles become more easily.

![Diagram showing the process of academic writing](image)

*Figure 3. E-readers affording a better academic writing environment*

**For peers**

The role of e-readers is the medium for sharing annotation and comments in peer assessment. Through the Internet, e-readers make exchanges of annotation and drafts more easily. With e-readers, students can receive abundant and immediate feedback from peers which is strongly correlated with effective writing. Therefore, students have more opportunities to view assignments of peers. In this study, students used e-readers to support collaborative assessment and annotations which both can improve their learning achievement through the writing process.

**For teachers**

E-readers are the convenient tools to develop and manage digital learning materials. With the Internet connection, teachers are more easily to organize and manage their digital teaching materials because of the reusability and adaptability of e-readers.

Moreover, e-readers are the aid for saving revised drafts and portfolios. Through the peer assessment with e-readers, teachers can obtain the immediate updated feedback from students. E-readers can keep the revised and annotated drafts and, therefore, reduce the burden of teachers when they have to evaluate and monitor the learning process of students.

**Conclusion**

This study is a long-term investigation of how e-readers could enhance the academic writing of EFL students. It discusses the pedagogical basis for the writing process, as well as the benefits e-readers can bring to the classroom. Findings indicate that e-readers affected the process of reading, annotation, and information retrieval with the unique functions. For EFL students’ academic writing, e-readers can be the tool for reciprocal peer assessment that aided academic writing. This study concludes with the role of e-readers in the academic writing classroom and further discusses how to use e-readers to facilitate academic writing in the classroom. With the research findings mentioned above, this study conclude that: (1) The e-reader is significantly beneficial for students’ academic writing progress and may potentially help students improve their writing compared to the conventional paper-based approach. (2) Both the students and instructor were positive on the usefulness, ease of use, ease of learning, satisfaction and
functionality dimensions of e-readers in the academic writing classroom. (3) This integration of the e-readers into the writing class was helpful throughout the writing process from an individual student, peer group and teacher’s perspective. E-readers have the potentials to assist the EFL students in academic writing and function as a handheld library, an annotating tool, a medium for sharing annotations and comments and a storage for revised drafts. Moreover, the functions of e-readers can assist students’ writing process and make the recursive circle of steps more efficiently. E-readers could assist creating a better writing environment in the process-based writing approach. In the meantime, more studies will be conducted in the future to explore the effects of e-readers in different domain knowledge.

Limitation of this study

This study was conducted in a natural setting in the graduate level course for exploring uses of e-readers in process-based academic writing. Due to the heavy burden of the teacher for correcting and commenting on every EFL student’s writings, the writing course is usually limited to about 20-25 students. It has to be admitted that this is relatively a small scale investigation. However, research findings supported by both the quantitative and qualitative data shed light on in-depth investigation of the roles of the e-readers in the academic writing. The findings in this study are significant and valuable but the results could not be generalized to the other subjects.

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