Effects of Incorporating a Topic-Scanning Guiding Mechanism in E-books on EFL Reading Comprehension, Learning Perceptions, and Reading Behaviors

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Abstract. Reading academic textbooks in English has been an uneasy task for non-native English students. In addition, e-books are gradually popular across educational contexts. Previous studies indicated that students generally could not comprehend texts well on screen, so this study proposed a topic-scanning guiding mechanism with e-books to support EFL students reading comprehension from e-books. This paper aims to investigate the effects of an e-book on EFL students' reading comprehension, learning perceptions, and reading behaviors in EFL freshman reading the course, incorporating a topic-scanning guiding mechanism with the e-book. A quasi-experiment with a pretest-posttest design was conducted in a university freshmen English course, 50 students were assigned as the experiential group, and 46 students were in the control group. Findings from this study would further contribute to students' learning perceptions and reading behavior analysis on designing e-book system to improve their reading competence.

Keywords: Reading comprehension · Learning analytics · E-book

1 Introduction

E-books have become one of the popular reading tools (Woody et al. 2010). The use of e-books has some beneficial impacts on supporting readers. Liu and Leveridge (2017) mentioned that reading in e-books can enhance learners' vocabulary. Chen et al. (2013) claimed that e-books showed positive effects on EFL students' reading fluency. However, several researchers indicated that reading academic materials in English has been recognized as a challenging task for English as a foreign language (EFL) learners (Li et al. 2013). In addition, Chou (2012) found that e-books have decreased EFL graduate students' reading comprehension. Therefore, it is substantial to explore a method of e-book instructional scaffolding as it helps EFL students facilitate their reading comprehension. A topic-scanning guiding mechanism in e-books was

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developed in this study to foster EFL students' reading. Additionally, the ultimate aims of the research are to assess the effects of the proposed mechanism by collecting and students' reading achievement, learning perceptions, and reading logs of students reading behaviors. The research questions are as follows:

1. Is there a difference in reading comprehension for the topic-scanning guiding mechanism with e-books compared to the conventional reading approach with e-books?
2. Is there a difference in learning perceptions: learning satisfaction, ease of use, and cognitive load for the topic-scanning guiding mechanism with e-books compared to the conventional reading approach with e-books?
3. Is there a difference in the reading behaviors: numbers of highlighting in red and yellow markers, total time and words annotation in e-books for the topic-scanning guiding mechanism with e-books compared to the conventional reading approach with e-books?

2 Literature Review

2.1 E-books on EFL Learners' Reading

Reading e-books is different from reading textbooks (Rockinson-Szapkiw et al. 2013). Lately, technologically advanced e-books and application de-vices are more innovative, so it became suitable for educational use and may continue to adjust the reading familiarity for readers. Adopting e-books can increase intermediate level EFL students' vocabulary ability and attitude (Chen et al. 2013). Nevertheless, reading is an intricate cognitive process since learners need to construct meaning from the context in the reading text during the reading (Hwang et al. 2018). Reading strategies such as underlining, taking notes, or highlighting the text, can support EFL readers comprehend and recall the content. (Cogmen and Saracaloglu 2009). Since the mental reconstruction of text structure and reading comprehension are correlated (Mangen et al. 2013), this study utilized the above reading strategies to facilitate students in reconstructing the text structure. Direct demonstrating and scaffolding of instruction are important in training EFL students to tactically read information from text structure (Meyer and Ray 2017). Accordingly, reading instructors' guidance in setting the reading goals that motivate topic scanning (Duggan and Payne 2009; Just et al. 1987) is often adopted, as the text is first skimmed to extract the gist for reading comprehension. This study, therefore, focused on utilizing the above reading strategies, especially in using the topic-scanning mechanism, to identify main ideas for e-book reading comprehension.

2.2 Topic-Scanning Guiding Mechanism

Previous studies showed that reading strategies, such as scanning and skimming could help readers' reading comprehension (Anderson 2010; White et al. 2015; Yusuf et al. 2017). Scanning is one of the pre-reading strategies that require readers to look at

specific keywords through text (Liaw 2017). Brown (2003) specified that scanning is to look for a particular piece or pieces of information in a text. Topic scanning means to browse promptly for the main ideas and specific information related to the main ideas of the texts (Duggan and Payne 2009). Topic scanning is essential to improve a comprehensive understanding of the developments involved in word recognition. White et al. (2015) defined topic scanning is that the texts were browsed only the essential main point. In addition to topic scanning, a concept mapping reading instruction offers students a more structural and organized method to make it easier to understand the texts (Hwang et al. 2018; Liu et al. 2010). Both concept mapping and scanning are two of the practical and constructive reading strategies. Therefore, this study proposes the topic scanning with concept mapping reading strategy instruction as the topic-scanning guiding mechanism.

3 Instructional Design

Learning management platform, Moodle was integrating with the BookRoll and Analysis Tool. The e-book system, BookRoll, is to support students' reading and learning (see Fig. 1). The instructor can simply log in to the Moodle system to manage the course reading materials, conduct questions for students' comprehensions, and provide scaffolding materials; such as concept maps of the text in the BookRoll (Akçapınar et al. 2019), and monitor students' reading and learning in the Analysis Tool (Flanagan et al. 2019; Ogata et al. 2017).

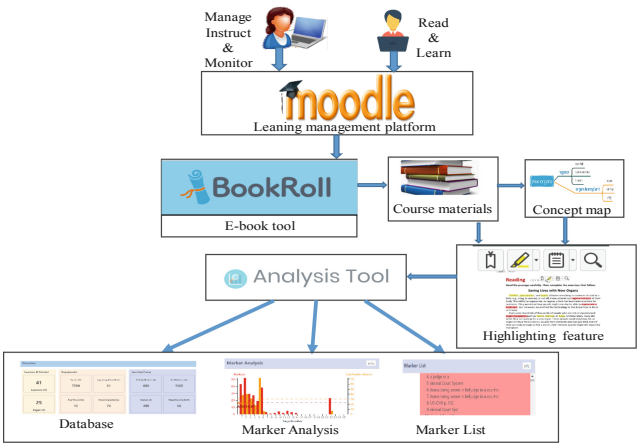

Fig. 1. Structure of the learning management platform with an e-book tool and an analysis tool for supporting students reading.

4 The Research Design

4.1 Participants

The present study examined a convenience sample of 96 undergraduate students. Two classes of one Freshman English course were taken part in the experiment with a quasi-experimental design. The participants were 62 male 34 female first-year college students taking the Freshman English course in the Spring Semester of the 2019 academic year. The two classes were taught by the same experienced EFL instructor to avoid the effect of different instructors on the experimental results. The students 50 (30 male 20 female) in the experimental group read with the topic-scanning guiding approach incorporated into the e-books whereas those 46 (32 male 14 female) students in the control group read with the conventional reading approach. The participants' English proficiency was ranked as the elementary proficiency level based on their TOEIC scores (Qu et al. 2017).

4.2 Procedures

To evaluate the effect of the topic-scanning guiding model with e-books on students' reading comprehension, learning perception, and reading behaviors, quantitative measurements of data collection, and a quasi-experimental design have been utilized. This study was conducted in 8 weeks. The two groups of the participants completed a pretest of reading comprehension one week before the experiment. The instructor went through three chapters: Chapter 9-Innocent until Proven Guilty, Chapter 10-Saving lives with new organs, Chapter 12-Medicine today from the textbook Reading for Today 3: Issues (Smith and Mare 2017) in this experiment for 6 weeks. All the participants spent 2 weeks learning each chapter.

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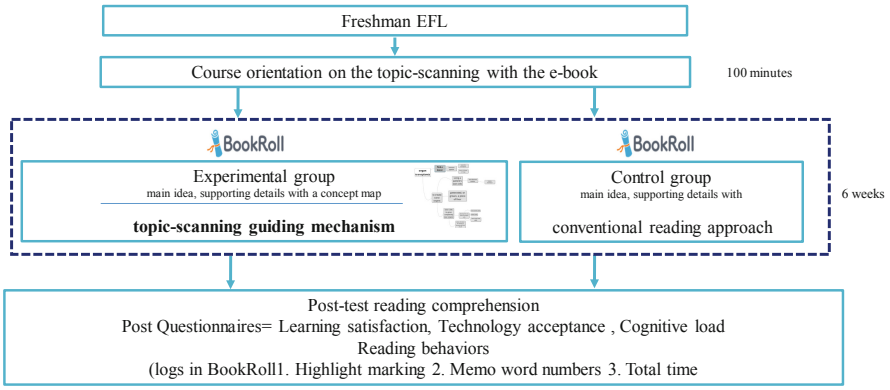

Fig. 2. The experiment process of the data collection.

4.3 Measuring Instruments

In this study, the students' reading comprehension, learning perceptions, and reading behaviors were assessed. To evaluate the participants' reading comprehension, they took pre- and post-reading comprehension tests, which are 30 multiple-choice questions. The reading tests were provided by the textbook Reading for Today 3: Issues (Smith and Mare 2017) and revised by the two experienced instructors. The total score of both tests was 100. The Cronbach's alpha value of the reading comprehension test is 0.86.

The questionnaire of learning satisfaction was adopted based on the questionnaire to measure the level of learning satisfaction developed by Chu et al. (2010). It consists of 12 items. To measure participants' technology acceptance, the questionnaire of the seven items for the ease of use dimension, and the 8 item of the cognitive load was from Hwang et al. (2013). The Cronbach's alpha values of the three were 0.95, 0.93, and 0.93, respectively.

The time spent reading the text and the words highlighted in the assigned tasks were recorded for analysis of participants' reading behaviors on BookRoll from the Analysis Tool (Akçapinar et al. 2019; Hasnine et al. 2019; Ogata et al. 2017).

5 The Research Design

5.1 Analysis of Reading Comprehension

One-way ANCOVA was conducted to eliminate unwanted variance on the dependent variable and increase test sensitivity (Tabachnick & Fidell, 2013), and to evaluate reading comprehension. The results of a one-way ANCOVA on reading comprehension demonstrated the analysis of homogeneity of regression with ($F = 0.197$, $p = 0.659 > 0.05$), indicating that the prior English reading of the two groups was equivalent before the experiment. The experimental group of the pretest scores was 66.80, SD = 17.59 while the control group is 66.52, SD = 16.60 as in Fig. 3, which showed no significant level of difference in the pre-test scores of the two group.

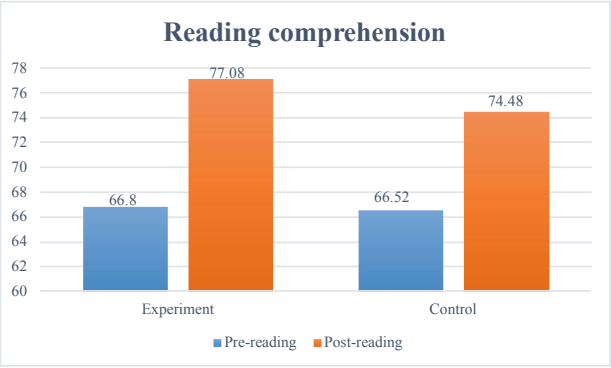

Fig. 3. The result of the reading comprehension for the two groups

There was a difference between the experimental and control groups in reading comprehension and shows the descriptive data and the ANCOVA of the post-test results. The adjusted mean values of the post-test scores were 77.08 (*Std. error* = 1.38) and 74.48 (*Std. error* = 1.28) for the experimental group and the control group, respectively as shown in Fig. 3, The result of the ANCOVA identified a significant difference between the two groups ($F = 3.75$, $p = 0.05$, $\eta^2 = 0.039$), indicating that the topic-scanning mechanism had significantly positive effects on the reading comprehension of students in the experimental group.

The independent samples *t*-tests were performed to assess the impact of the learning perceptions, such as learning satisfaction, the technology acceptance-ease of use, and cognitive. It is recognized that learning satisfaction $t = 1.72$ ($p > .05$, $d = 0.34$) had a little higher degree, but with no significant difference, on the experimental group ($M = 3.73$ $SD = 0.86$) than on the control group ($M = 3.45$ $SD = 0.78$). It is found that the technology acceptance-ease of use $t = 0.90$ ($p > .05$, $d = 0.18$) was with no significant difference on the experimental group ($M = 3.75$ $SD = 0.81$) and the control group ($M = 3.60$ $SD = 0.83$) as shown in Fig. 4.

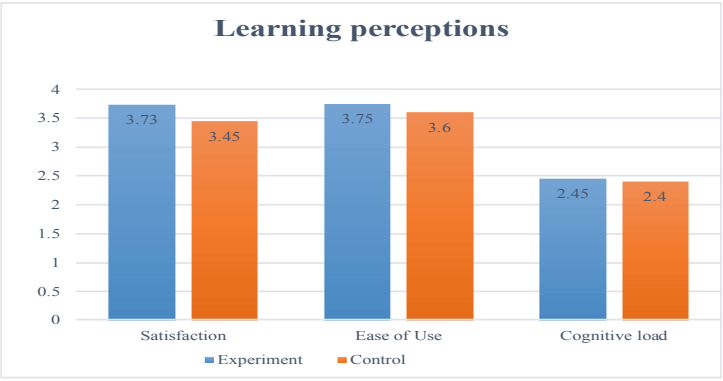

Fig. 4. The results of the three learning perceptions

The results of the cognitive load $t = 0.31$ ($p > .05$, d = 0.06) revealed that there is no statistically significant differences between the experimental group (M = 2.45 SD = 0.87) and the control group (M = 2.40 SD = 0.82).

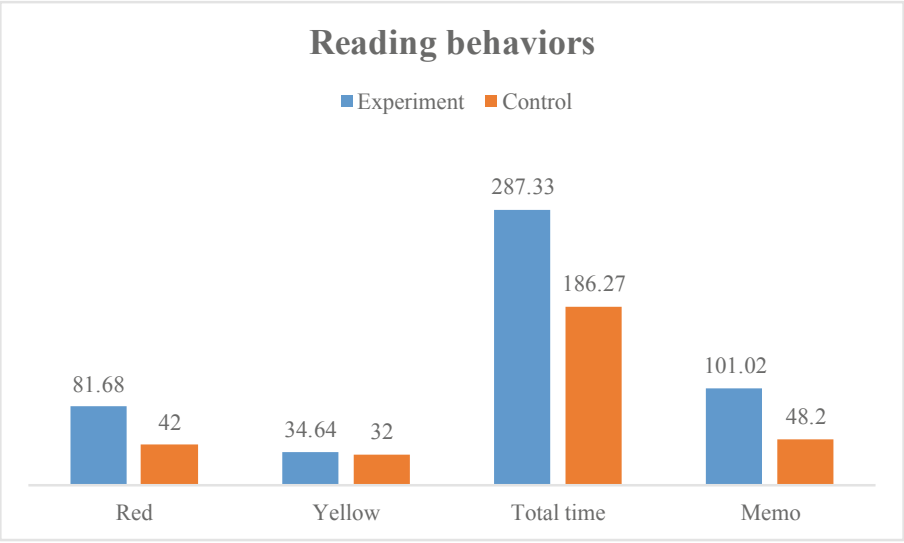

Fig. 5. The reading behaviors and results for the two groups.

The students' reading behaviors were retrieved for explorative data analysis to thoroughly gauge the information concerning the students' reading behavior patterns. The independent-samples t-tests compared between two groups to assess the reading behaviors include the number of red markers highlighted, number of yellow markers highlighted, the total time spent on the eBook system in minutes, and number of memos typed by the students. The results of the t-tests showed significant difference between the two groups (in Fig. 5) in terms of red markers highlighted (t = 2.87, p < .001, *Cohen's d* = 0.62), the total time spend on eBook system in minutes (t = 2.59, p < .05, *Cohen's d* = 0.50), and number of memos typed by the students (t = 2.40, p < .001, *Cohen's d* = 0.50).The experimental group in red markers, the total time, number of memos were M = 81.69, SD = 79.34, M = 287.33, SD = 250.75, and M = 101.02, SD = 138.78 respectively. For the control group they were M = 42.00 SD = 42.96, M = 186. 27 SD = 151.36, and M = 48.20 SD = 57.37. However, it was found that there was no significant difference between the two groups in terms of the number of yellow markers highlighted by the students (t = 2.873, p > .001).

6 Conclusion

This study proposed the topic-scanning guiding mechanism in e-books for supporting EFL students' reading comprehension. An experiment was conducted to examine the effects of the proposed mechanism on the reading comprehension, learning perceptions, and reading behavior of participants. The results showed that the participants in the experimental group gained higher comprehension scores than the control group. This indicated that there is a difference in reading comprehension for the topic-scanning guiding mechanism with e-books compared to the conventional reading approach with e-books. However, we found that the participants in the experimental group and the control group were not significantly different in learning perceptions. The result may be explained that both the experimental group and the control group read used BookRoll system which can be inferred that it did not affect their learning perceptions whether the participants integrated with the topic scanning guiding mechanism or not. Therefore, there is not a significant difference in learning perception: learning satisfaction, cognitive load, and technology acceptance for the topic-scanning guiding mechanism with e-books compared to the conventional reading approach with e-books.

In addition, the Analysis Tool was used for recording reader behavior patterns from participants. The results displayed that there were significant differences in the reading behaviors of words highlighting and words annotation in e-books for the topic-scanning guiding mechanism with e-books compared to the conventional reading approach with e-books. The results of students' reading behaviors (highlighting, reading time, and memo word numbers) provided evidence to support the topic-scanning guiding mechanism in e-books. As Meyer and Ray (2017) indicated that the importance of scaffolding and instructing in training students to tactically read information from text structure should not be overlooked. Providing reading strategies in e-books, such as the topic-scanning guiding mechanism can promote students reading behaviors in e-books.

This study makes distinct contributions to an e-book system development and the conduct of research related to an e-book adoption. First, this study confirms the importance of reading strategies in the adoption for reading comprehension purposes (Ness 2016). While authors have examined perceived satisfactory, ease of use, and cognitive load in research related to e-books, this study finds strong support for behavioral patterns to use eBook readers. The robust impact of reading strategies with an e-book is suitable in future research related to e-book research and readers' reading behavioral patterns. This study demonstrated that, in the context of e-book learning, avail-ability of reading strategy guiding is an essential factor. Future studies should further consider and examine the use of other English learning strategies intended at improving not only the reading but the writing of EFL learners by using e-books.

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