A learner-based approach of applying online reading to improve learner autonomy and lexical knowledge

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This study investigated a learner-based approach of applying online reading to improve learner autonomy and lexical knowledge. Learner autonomy was operationalized as learners' self-initiation and self-regulation. A total of 90 students at a Chinese university were divided equally into three groups. Participants in the Experimental Group One (EG1) read online after receiving a package of nine hourly sessions in metacognitive strategy training. Participants in the Experimental Group Two (EG2) read online without receiving any strategy training. Participants in the Control Group (CG) only read printed versions of the target materials. Students in the EG1 outperformed those in the other two groups in terms of their ability to plan, monitor, and evaluate reading. Planning became the most exercised skill, followed by evaluating and monitoring. A significant difference between EG2 and CG with respect to their abilities was not detected. Students in the EG1 also improved the most in lexical knowledge, and although students in the EG2 showed higher lexical knowledge scores than those in the CG, the difference was not significant. In addition, improvements in lexical knowledge were maintained best by EG1 on a delayed test. Overall, this study suggests that providing students with metacognitive strategy training for online reading is an effective approach.

Keywords: learner autonomy, lexical knowledge, metacognitive strategy training, online reading

1. Introduction

This study aimed to enhance the learner autonomy and vocabulary acquisition of students who learn English as a Foreign Language (EFL). Learner autonomy (LA) refers to "the capacity to control one's own learning" (Benson, 2001, p. 47). The last three decades have witnessed an advocacy towards LA (Teng, 2018), with numerous

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empirical studies being conducted to find ways to improve LA. However, the empirical data are not enough to arrive at a clear understanding of the nature of autonomy in EFL, or ideally, to improve LA (Benson, 2007; Gardner, 2006; Teng, 2015a). As a result, it is worthwhile to investigate new methods for fostering LA.

Likewise, it is also important to explore various methods for improving learners' vocabulary (Nation, 2013). There is a general consensus on the importance of vocabulary in learning a language. Vocabulary is the building foundation for learning a language, and it is impossible to master a language without acquiring a sufficient vocabulary knowledge. As proposed by Schmitt (2008), without grammar very little can be conveyed, and without words nothing can be expressed.

1.1 Approaches to developing LA

LA includes two threads: self-initiation and self-regulation (O'Malley & Chamot, 1990), which are the specific types of LA that are explored in the present study. Self-initiation is a learner's willingness to learn without being forced to learn. This includes 'reasons for learning' and 'efforts made for learning' (Nguyen & Gu, 2013, p. 13). Self-regulation refers to a system of conscious personal management that involves the process of guiding one's own thoughts, behaviors, and feelings to reach goals through some strategies such as planning, monitoring, and evaluating (Baumeister, Schmeichel, & Vohs, 2007; Blair & Ursache, 2011). Planning takes place before the task is performed. It is the process of setting a plan for implementing the task. Monitoring occurs while the task is being undertaken. This stage is what Zimmerman (2002) calls "a covert form of self-observation" (p. 68). Evaluation is carried out after the task is completed. It involves the comparison of learners' progress against task criteria to make judgments about the performance of the learners (Butler, 2002). In essence, the self-regulation component represents a set of strategies that are teachable. However, the self-initiation component is learner-driven, which is difficult to teach (Gu, 2007). Thus, much research has been conducted on strategies to improve learners' self-regulation. To that end, Benson (2001) classifies six approaches, which are resource-based, classroom-based, teacher-based, curriculum-based, technology-based, and learner-based. This paper focuses specifically on the learner-based approach.

The learner-based approach assumes that students' learning behaviors can be changed by providing them with relevant skills that can foster their autonomy and language learning. Available research on strategy training provides convincing evidence on the usefulness of LA in promoting language learning. Along these lines, Kumaravadivelu (2003) focused on learners' psychological and strategic preparation and Wenden (2002) suggested the potential of LA in increasing learners' metacognitive knowledge. This includes studying the nature of the task, learning

the best method to approach the task, and monitoring personal factors due to the continuous nature of learning. Huang (2006) attempted to familiarize students with planning, monitoring, and evaluating their learning. The aforementioned studies highlighted the role of teachers in supporting learners to develop LA. This also leads to the assumption that LA may be efficiently promoted by providing students with training in metacognitive strategies while implying a positive relationship between metacognition training and the achievement of greater language learning. Metacognition generally involves learners' knowledge and the awareness of their own cognitive processes and outcomes (Flavell, 1979). Hacker, Dunlosky, and Graesser (1998) conceptualized metacognition as having three parts: thinking of what one knows (metacognitive knowledge), thinking of what one is currently doing (metacognitive skill) and thinking of what one's current cognitive or affective state is (metacognitive experience). Research shows that metacognition plays an important role in English learning. For example, metacognition plays the role of a fixer or a problem solver, wherein learners use the toolbox of strategies for achieving multifarious goals such as repairing the failure to listen (Goh & Taib, 2006), enhancing writing performance (Larkin, 2009; Teng, 2016), and maximizing word learning performance (Lubliner & Smetana, 2005), among others. In addition, metacognition is essential to the development of LA (Nguyen & Gu, 2013; Rubin, Chamot, Harris, & Anderson, 2007).

The learner-based approach aims to help learners grasp specific skills and strategies that are required for maximizing learning opportunities. In this regard, strategy training can be incorporated into the second language curriculum because the training focuses on increasing learners' awareness of the various language learning strategies while enabling them to apply these strategies for learning and using target language. The four suggested steps in a strategy training program normally include raising awareness, presenting and modeling, providing multiple practice opportunities, and evaluating the effectiveness of strategies as well as transferring strategies to new tasks (Rubin et al., 2007). Chamot, Barnhardt, El-Dinary, and Robbins (1999) proposed a Cognitive Academic Language Learning Approach (CALLA) model, which is a comprehensive strategy training framework for language learners. The distinctive advantage of this model is that it enables learners to take additional responsibilities, which in turn allows teachers to remove the scaffolding gradually and facilitate LA in the classroom. Furthermore, the model allows adjustments in time allocation and teacher support as per the level of autonomy achieved by the learners. Two notable experimental studies that used this model were Gu (2007) and Nguyen and Gu (2013), where strategy training was incorporated into a writing course. Results revealed that learners who received strategy training outperformed their counterparts without training in writing performance.

1.2 Approaches to improving lexical knowledge

One of the most important responsibilities of EFL teachers is to help students develop a large vocabulary. Traditional approaches to fostering vocabulary development mainly fall into two broad categories: learning new words directly and incidental vocabulary learning (Nation, 2013).

Researchers have defined direct vocabulary learning as an activity where learners focus on their vocabulary learning through exercises and activities. For example, through word-building exercises (McCandliss, Beck, Sandak, & Perfetti, 2003), teaching vocabulary with images (Dörnyei & Chan, 2013), deliberate learning of word lists (Hu, 2012), using context clues (Teng & He, 2015), using the dictionary (Cubillo, 2002), vocabulary games (Wells & Narkon, 2011), and computer-based technology (Nakata, 2008). Although intentional vocabulary learning is found to have superior learning gains when compared to incidental vocabulary learning (Schmitt, 2008), classroom time is typically limited to explicit instruction of target words.

Generally, school-age children learn about 3,000 new words a year, though only about 10 percent of these words come from direct vocabulary instruction, and the rest come from their everyday experiences with oral communication, listening to text read aloud, and reading a wide variety of texts independently (Nation, 2011). This observation implies that the majority of vocabulary is acquired through implicit instruction, and this observation has led researchers to endeavor toward improving incidental vocabulary learning. However, previous results have shown limited learning gains (e.g., Teng, 2014a; Van Zealand & Schmitt, 2013), which may be due to the absence of certain conditions that facilitate incidental vocabulary learning. First, the students must be interested in understanding the input from reading and listening. Second, the language input from reading or listening should contain few items that are beyond the learners' current level of achievement. Third, these items should be understandable from the internal context of the learners. However, these conditions are seldom present in an EFL setting. Due to these conflicting findings, effective word learning has swung from explicit teaching to incidental learning, and then back to the middle – incidental learning plus direct instruction of new words. Although this approach has shown positive results, only partial knowledge of new words was acquired (Teng, 2015b). Aside from direct teaching and incidental vocabulary learning, Beck and McKeown (1985) created a three-tiered approach for teaching vocabulary to school children. Teachers employing this approach must ask students a few questions and categorize the target words into three tiers: Tier 1 (basic words), Tier 2 (frequently occurring words), and Tier 3 (low-frequency words). Teachers must then select appropriate words based on these tiers. In this context, target words for the lesson may vary depending on

the language level of the children. This approach can also be applied to the EFL teaching context because it can enable teachers to determine the methods that can be adopted for choosing target words.

A few studies have also shown a link between LA and word learning outcomes. For example, Pino-Silva (1993) attempted to improve the vocabulary knowledge of non-English major university students by employing untutored approaches. She prepared a list of 1,000 words or lexical phrases, based on consultation with colleagues and students, containing items perceived to cause difficulty while reading technical texts. She encouraged the students to apply self-study strategies or form study groups, beyond the classroom, and learn the words for three weeks. The findings revealed that the students' self-rating of their vocabulary knowledge increased significantly. In a similar vein, Dam and Legenhausen (1996) explored the effectiveness of autonomy-enhancing vocabulary learning through learners' self-selection of vocabulary. They argued that providing LA yielded results equal to or better than that of the control group, who received a traditional L2 learning education. These studies support the Self-Determination Theory, which is based on the idea that "the prototype of autonomous behavior [emanating from one's self] is intrinsically motivated" (Deci & Ryan, 1995, p. 37). Deci and Ryan (1995) argued that extrinsically regulated behaviors can also become intrinsic because learners have an innate tendency to "internalize and integrate meaningful aspects of one's social life" (p. 38). Along these lines, learners with more intrinsic motivation engage in more autonomous forms of learning. Furthermore, agency, which is regarded as the desires or actions of individual agents (Allwright & Hanks, 2009; Huang, 2013), also plays an important role in learning (Eteläpelto, Vähäsantanen, Hökkä, & Paloniemi, 2014). This could also have effects on learning vocabulary in EFL classes.

1.3 Online reading

With the growing prevalence of technology, EFL learners have increased exposure to online texts. Online reading has become a major source of input for EFL students, wherein students can gain instant access to a variety of resources. In order to facilitate EFL learners' understanding of online texts, a body of research has been conducted on learners' reading strategies (Coiro, 2011; Coiro & Dobler, 2007; Lin & Chen, 2007).

It has also been proposed that online reading requires comprehension that goes beyond the information delivery potential of traditional reading strategies (Castek et al., 2007). It is suggested that online English readers need both traditional reading strategies and metacognitive strategies (Afflerbach & Cho, 2009). In spite

of the relevance of online reading, research on applying online reading software in EFL teaching is limited (Chun, 2011). In addition, there is a lack of research on integrating training in metacognitive strategies for online reading and there is also limited research on measuring the effects of metacognition training on fostering autonomous learning and lexical knowledge in EFL learners.

1.4 The present study

There are two main reasons for conducting this research. First, an online reading-based approach to LA development depends on the provision of opportunities for learners to engage efficiently and exercise control over their learning (Park, Yang, & Hsieh, 2014). This learner-based approach requires that learners acquire specific metacognitive strategies which would equip them with the skills that enable them to make the most of the opportunities in their learning environment. Secondly, there is a need to address the lack of research on training strategies for online reading during regular class hours, which may have a positive impact on vocabulary acquisition.

LA was operationalized as a learner's self-initiation and self-regulation, which are the specific types of LA that are explored in the present study. The present study is a follow-up of Nguyen and Gu's (2013) study, the aim of which was to explore whether metacognitive strategy training for online reading would be effective in improving LA and EFL lexical knowledge. The following research questions were addressed:

1. Does training in metacognitive strategies for online reading lead to improved lexical knowledge? Are these improvements maintained?
2. Does training in metacognitive strategies for online reading result in higher LA?

2. Method

2.1 Participants

The present study involved both teachers and students from a university in China. Three English teachers, each with a Master's Degree in English education and 8 years of experience in teaching English reading, were selected on a voluntary basis.

A total of 90 students – 34 males and 56 females – were involved in this research. The students were between 19 and 21 years of age during the study, were

majoring in business English and their native language (L1) was Chinese. These participants had received approximately 400 periods (40 minutes each) of English lessons prior to the commencement of the research. These lessons included reading, speaking, listening, writing, pronunciation, and grammar. Of the 400 periods, there were 72 periods of reading lessons.

The students were in a College English Test band 4 (CET 4) preparation unit. The CET is a nationwide test, administered by the National College English Testing Committee in China. This test aims to provide a reliable, accurate, and comprehensive measure of university students' proficiency in English. The CET consists of three tests: CET band 4, CET band 6, and the CET spoken English test. A knowledge of about 3,000–4,000 word families is necessary to pass the band 4 test and a basic word level of about 5,000–6,000 word families is necessary to pass the band 6 test (Zheng & Cheng, 2008).

Initially, 106 students from three parallel classes were considered for the study; however, with an aim of achieving group compatibility and considering certain practical constraints, only 90 students were selected on the basis of internal reading comprehension results. The 90 participants were divided into three groups, with 30 in each group. These groups were Experimental Group One (EG1), Experimental Group Two (EG2) and a Control Group (CG). Participants in EG1 read online after receiving a package of nine hourly sessions in metacognitive strategy training. Participants in EG2 read online without receiving any strategy training. Participants in the CG only read printed versions of the target materials. All participants had an intermediate level of proficiency in English. This was measured by a reading comprehension test in which both experimental groups obtained a mean score of 20.7 (out of 40) and the CG achieved a mean score of 21.2. ANOVA results reveal that the scores do not differ significantly (F (2, 28) = 2.191, p = .78).

2.2 Software for online reading

The software used for online reading in the present study is called Shanbei Reading. (Shanbei Reading, 2014).[1] A screenshot of Shanbei Reading is provided in Appendix A. This free software can be installed on a computer or mobile phone. Shanbei Reading provides text, image, and audio to assist online reading. The Shanbei Reading screen is divided into three main sections. The first section displays text that can be read by learners online, and the section also contains a

1. The researcher of this research has neither affiliation with nor financial interest in this software.

picture to help learners understand the text. The second section provides explanation for words that the learners encounter for the first time. The explanation of these unfamiliar words appears at the bottom of the screen. The third section provides an explanation that enables learners to understand the meaning of unfamiliar words. Learners can also listen to the recitation of the word by clicking on a speaker icon.

The words clicked by individual learners while reading can be stored in his/her own personalized 'new word bank.' In addition, the words that learners have already learnt are highlighted in red when they appear in a new text. The amount of reading completed and number of words acquired is shown daily through a graph (See Appendix B).

The reading materials in this software include texts for primary and secondary school students, CET takers (band 4 and band 6), and IELTS, TOEFL, SAT, and GRE test takers. As noted above, the participants were in a CET4 preparation unit, and hence the students were encouraged to read the materials adapted for band 4. These included *Alice's Adventures in Wonderland, The Setting of the Stage, The Little Prince,* and *The Story of Mankind*. The printed versions of these materials were also prepared for the CG.

2.3 Target items

Twenty words were selected from the books mentioned above (see Appendix C), and these words were within the 4,000–6,000 word list. This was done by using an online Vocabprofile program (Cobb, 2000). This program can match the words in a text with certain word lists. In addition, based on the author's teaching experience, these words were considered to be difficult for the participants.

2.4 Materials

2.4.1 *Training package*

This package included nine hourly sessions, which were developed on the basis of research conducted by Nguyen and Gu (2013). These sessions were also incorporated into the 36-hour English reading lesson over one semester. As the participants were English-majors, instructions were delivered mainly in English. Chinese was used to explain difficult items because students can comprehend better in their L1, which in this case is Chinese. This training package is presented in Table 1.

Table 1. The nine hourly sessions of metacognitive training

Hourly sessions	Metacognitive training
Session one	Providing students with directions on the importance of online reading, as well as the objectives involved in using online reading
Session two	Providing background knowledge about planning, monitoring, and evaluating their online reading. For planning, learners set up daily and weekly goals for online reading. They then monitored their reading strategy use and self-evaluated their success and failure in using these strategies while doing online reading.
Session three	Providing learners with instructions about how to create an organizational plan for an online reading task.
Session four	Providing students with further reading strategies (Park, Yang, & Hsieh, 2014), which were designed to develop an awareness of online reading.
Session five	Teaching learners how to use certain strategies to critically analyze and evaluate the information embedded in the materials while reading online.
Session six	Training learners how to use particular strategies to locate the contextual clues to figure out the meaning of unknown words while conducting online reading.
Session seven	Allowing students to practice their planning skills for online reading. This included how they set a goal for online reading, and whether the goal was realistic or not.
Session eight	Equipping learners with the skills necessary to monitor the performance of an online reading task.
Session nine	Familiarizing the students with the skill of evaluating their performance on online reading tasks. This also included practicing all the metacognitive skills they had learned.

Overall, the steps of the nine-hourly sessions in Table 1 were designed to help learners plan, monitor, and evaluate their online reading.

2.4.2 *Instruments*

2.4.2.1 *Questionnaire*

A questionnaire adapted from previous studies (Nguyen, 2009; Zhang, Aryadoust, & Zhang, 2014) was employed to assess the participants' reasons for the efforts made for reading, and planning, monitoring, and evaluating their reading. This questionnaire (see Appendix D) was measured using a Likert Scale of 1–5 (1=strongly disagree, 5=strongly agree). Potential changes in LA were ascertained by administering the same questionnaire at both the beginning and the end of the program. Cronbach's alpha was found to be $\alpha = 0.76$ for the pre-test and $\alpha = 0.78$ for the post-test.

2.4.2.2 *Pre-and post-program tests*

Paribakht and Wesche's (1996) Vocabulary Knowledge Scale (VKS), which is a five-level scoring scale applied successfully in many previous studies (Folse, 2006; Nassaji & Tian, 2010; Teng & He, 2015), was adapted for the present study. The test item (word) appeared above the measurement scale, as illustrated in Table 2. This test served as the pretest, the posttest, and the delayed test. The reliability of this test (.89) has been shown in another study (Wesche & Paribakht, 1996). It can be used to measure word knowledge effectively on a continuum, from complete unfamiliarity to a proficiency, thereby revealing the progress made by students in producing a syntactically and semantically correct sentence using the target word (Teng, 2014b). Thus, it was used as a measure of participants' proficiency in lexical knowledge.

Table 2. An example of the vocabulary knowledge scale for testing target words

scrupulous
I. I don't remember having seen this word before.
II. I have seen this word before, but I don't know what it means.
III. I have seen this word before, and I think it means _____ (synonym or translation).
IV. I know this word. It means _____ (synonym or translation).
V. I can use this word in a sentence (write a sentence): _____. (If you do this section, please also do Section IV.)

Table 3. A five-level scoring scale: Meaning of scores

Self-report categories	Possible scores	Meaning of scores
I	1	The meaning is not familiar at all
II	2	The word is familiar but its meaning is not known
III	3	A correct synonym or translation is given
IV	4	The word is used with semantic appropriateness in a sentence
V	5	The word is used with semantic appropriateness and grammatical accuracy in a sentence

Table 3 presents the scoring system. In this case, a score of 1 was allotted to learners who stated their unfamiliarity with the target words. Learners who had encountered the word, but were unfamiliar with its meaning, achieved a score of 2. In this case, the learner was either unfamiliar with the word's meaning or provided an incorrect meaning for the word. A score of 3 was given to learners who could provide an

acceptable synonym, English definition or L1 translation. A score of 4 was credited to learners who could use the target word with semantic appropriateness in a sentence, regardless of the grammaticality of the sentence. A score of 5 was given to learners who could use the word with semantic appropriateness and grammatical accuracy in a sentence. As noted above, 20 target words were selected. Thus the maximum possible score for this test was 100 points.

The VKS employed in this study was a paper-and-pencil test. The test was scored independently by two trained scorers. A third independent rater was invited to resolve differences between the raters as required. In such circumstances, the score was determined by the majority. This scoring design ensured scoring accuracy. The inter-rater reliability was found to be 95%, which is considered to be a high score.

2.4.2.3 *Group interview*

The author was responsible for a group interview and acted as a facilitator. Six students from EG1 were involved in the interview on a voluntary basis, and the total time set for the interview was 30 minutes. The purpose of the interview was to understand the aspects of each metacognitive skill, which the students exercised during or after the training. Example questions for the interview are presented in Appendix E.

2.4.2.4 *Delayed tests*

To avoid problems associated with attempting to create different tests of equal levels of difficulty, the delayed tests were identical with the pretest and posttest except the order in which the items were presented. The change in order prevented learners from memorizing the target words and thus scoring beyond their true abilities on this test (Laufer & Rozovski-Roitblat, 2011).

2.4.2.5 *Procedures*

All participants completed a VKS test (60 minutes) in July 2014, which was the end of a semester. This served as a pre-test. The students resumed the reading experiment after a two-month holiday. Although the target words were highlighted for the learners in the pretest, it is unlikely that the participants in this EFL context were able to retain those words, considering the two-month interval. In addition, during the 36-hour reading experiment, the words were not taught in an explicit manner. Following the pre-test, the students completed the LA questionnaire (30 minutes). The author distributed the questionnaire to the students and they all received the same instructions for completing the questionnaire.

In EG1, the reading course was co-taught by the author and one of the three teacher participants. The author was first responsible for the nine hourly sessions, discussed above, which focused on equipping students to employ the metacognitive

skills of planning, monitoring, and evaluating online reading. Seven steps were adapted from Chamot's (2005) CALLA framework for the training, which included a warm-up, preparation, explanation, presentation, practice, evaluation, and summary (Table 4). Following the training, students studied the content of the course in a computer room. The teacher was responsible for teaching the content. Students were required to complete the reading requirements mentioned above using the Shanbei Reading Software. The reading exercise took 27 hours, which was three-quarters of the course time.

Table 4. Structure for each session

Procedures	Activities	Role(s)	Time
Warm-up	Review of previously learned strategy	Teacher & Students	5 mins
Preparation	Finding the target strategy for online reading	Teacher & Students	5 mins
Explanation	Explaining the target strategy	Teacher	5 mins
Presentation	Presentation on the use of the target strategy	Teacher	5 mins
Practice	In-class actual use of the target strategy in reading tasks	Students	10 mins
Evaluation	Evaluation of the use of the target strategy in reading tasks	Students	5 mins
Summary	Review of the content of the session	Teacher & Students	5 mins

The second teacher participant was responsible for EG2. Students in this group were also required to study and complete the reading requirements in a computer room using the Shanbei Reading software. The reading exercise lasted for 36 hours. The third teacher was responsible for the CG. Students in the CG studied in a regular classroom and they spent 36 hours in reading printed versions of the materials. The student participants in EG2 and the CG did not receive the training. The participants in both EG1 and EG2 were encouraged to continue online reading of the materials after class. Participants in the CG were encouraged to read the printed materials after class.

The participants attended this course for two hours a week, and the entire reading experiment for the three groups took 36 hours. The author randomly observed three lessons in each of the three classes to ensure that the three classes were following the instructional goals. After the completion of the reading exercise, six student volunteers from EG1 were invited for a group interview (30 minutes). All the students were required to take a posttest, which was administered immediately after the reading exercise. Following the posttest, the students again completed the same LA questionnaire.

Four weeks later, the VKS test was administered again to measure retention ability. The target words were not taught during this break, and, it is unlikely that the students were exposed to the target words. The same test was given as the pretest, posttest, and as the delayed test. Based on pilot testing, the time for completing each test was set at 90 minutes.

3. Results

Question 1: Does the intervention training improve lexical knowledge? Are these improvements maintained?

Descriptive statistics are presented in Table 5 and Figure 1. The present study used an analysis of variance (ANOVA) to compare the mean scores of the three groups for the pre-, post-, and delayed test. The results are included in Table 5.

Table 5. Descriptive statistics and ANOVA results of the three groups

	Group	Mean	SD	N	*F*	Significance
Pre-test	EG1	22.500	1.535	30	1.198	0.309
	EG2	22.136	1.245	30		
	CG	22.772	1.306	30		
	Total	22.469	1.362	90		
Post-test	EG1	69.454	1.539	30	95.622	.000
	EG2	41.772	1.681	30		
	CG	41.045	1.353	30		
	Total	50.257	1.524	90		
Delayed test	EG1	58.090	1.687	30	34.897	.000
	EG2	30.500	1.132	30		
	CG	29.954	1.091	30		
	Total	39.515	1.303	90		

As shown in Table 5, the mean scores of the three groups varied slightly before the experiment. The CG had the highest mean score (22.772), followed by EG1 (22.500) and EG2 (22.136), though the differences between groups were not significant (F (2, 63) = 1.198, n.s.). Given that the test was out of 100, it is clear from the scores that the 20 target words were almost unknown to the learners in the three groups.

The three groups demonstrated gains in learning lexical knowledge of the target words. The mean scores of the three groups, which were evaluated immediately after the reading exercise, provided clear evidence of these gains in lexical knowledge. As can be seen in Table 5, EG1 had the highest mean score (69.454), followed

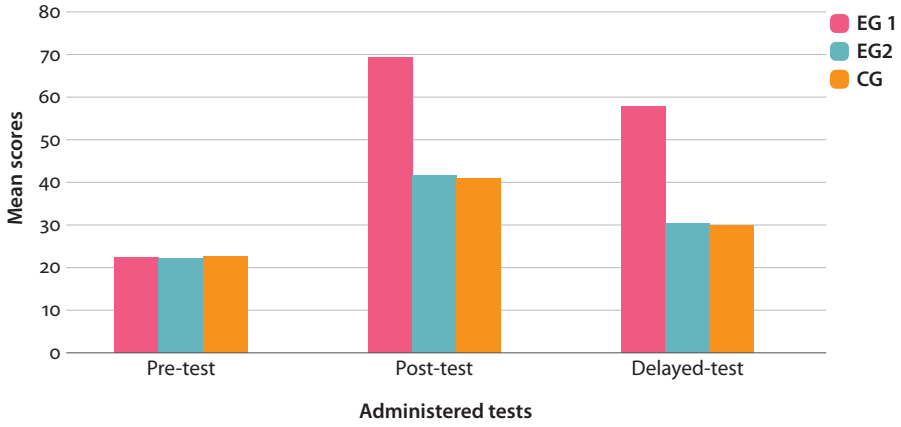

Figure 1. Mean scores of the three groups in different test time

by EG2 (41.772), and the CG (41.045). The differences in the mean scores of the three groups were significant (F (2, 63) = 95.622, $P < .05$). Post-hoc comparisons (Table 6) showed that EG1 significantly outperformed the other two groups in learning the target items ($P < .05$). Additionally, the difference in the mean scores between the CG and EG2 was not significant ($P > .05$).

Table 6. Post-hoc comparisons of scores in lexical knowledge across three groups

Tests	(I)Group	(J)Group	Mean difference(I-J)	Standard error	Significance
Post-test	EG1	EG2	28.409	.762	.000
		CG	29.181	.762	.000
	EG2	EG1	−28.409	.762	.000
		CG	.772	.762	.315
	CG	EG1	−29.181	.762	.000
		EG2	−.772	.762	.315
Delayed test	EG1	EG2	28.136	.387	.000
		CG	27.590	.387	.000
	EG2	EG1	−28.136	.387	.000
		CG	−.545	.387	.165
	CG	EG1	−27.590	.387	.000
		EG2	.545	.165	.165

Note. * $P < .05$

The three groups seemed to demonstrate an attrition in retaining lexical knowledge. In other words, mean scores dropped across the three groups over time, as shown in the mean scores of the three groups in the delayed test. However, EG1 still managed to maintain the highest mean score (58.090). The mean score of EG2

was 30.500, and the mean score of CG was 29.954. The groups do differ significantly (F (2, 63) = 34.897, $P < .05$) and the post-hoc comparisons in Table 6 showed that EG1 performed significantly better in retaining lexical knowledge than the other two groups ($P < .05$). In contrast, the difference in the mean scores between the CG and EG2 was not significant ($P > .05$).

Question 2: Does the intervention training improve LA?

The mean self-rating scores on the LA questionnaire were calculated by item for each group and at testing prior to and after the reading exercise. The mean gain was then calculated by subtracting the post-exercise questionnaire mean from the pre-exercise questionnaire mean. Each of the items was classified as either self-initiation or self-regulation. The scores revealing the reasons for English reading and making efforts to read English were included for self-initiation. Prior to the reading exercise, reasons for English reading across the three groups ranged negligibly from 3.845 to 3.858. The differences in making efforts to read English for the three groups also seemed to be minor (from 2.792 to 2.862). The ANOVA results did not reveal a significant difference among the three groups ($p > .05$), in terms of self-initiation prior to the exercise. Planning, monitoring, and evaluating were included for self-regulation, and the ANOVA results did not reveal a significant difference among the three groups for the three aspects of self-regulation. In general, it can be said that the differences in LA among the three groups were not significant before the training (Table 7 and Figure 2).

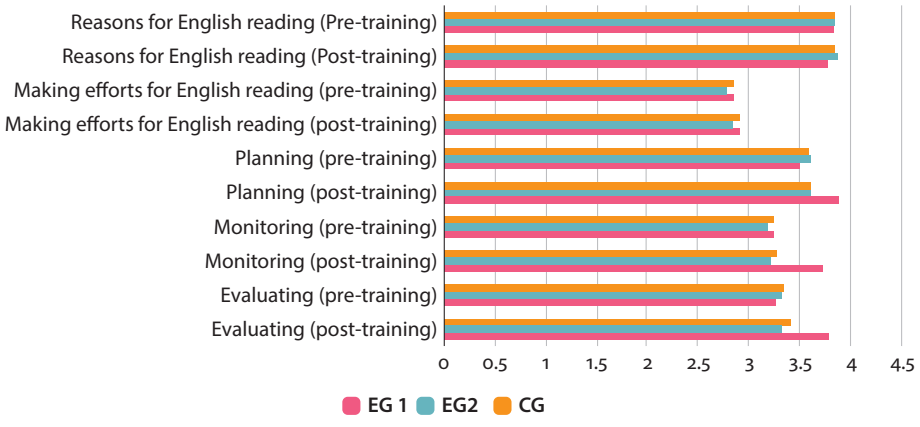

Figure 2. Elements of LA before and after training across three groups

Table 7. Descriptive statistics for LA across three groups

			N.	Pre-exercise Mean(SD)	Post-exercise Mean(SD)	Gain (post-pre) Mean(SD)
Self-initiation	Reasons for English reading	EG1	30	3.845(.652)	3.785(.654)	−.060(.590)
		EG2	30	3.856(.560)	3.886(.520)	.030(.510)
		CG	30	3.858(.520)	3.856(.510)	−.002(.492)
		Total	90	3.853(.577)	3.842(.561)	−.011(.530)
	Making efforts for English reading	EG1	30	2.856(.581)	2.922(.625)	.066(.598)
		EG2	30	2.792(.621)	2.851(.612)	.059(.451)
		CG	30	2.862(.610)	2.922(.592)	.060(.481)
		Total	90	2.836(.604)	2.898(.609)	.062(.510)
Self-regulation	planning	EG1	30	3.510(.551)	3.901(.521)	.391(.423)
		EG2	30	3.621(.621)	3.625(.605)	.004(.421)
		CG	30	3.605(.612)	3.621(.591)	.016(.451)
		Total	90	3.578(.594)	3.715(.572)	.137(.431)
	monitoring	EG1	30	3.252(.562)	3.744(.458)	.492(.412)
		EG2	30	3.202(.572)	3.221(.412)	.019(.405)
		CG	30	3.251(.495)	3.282(.421)	.031(.395)
		Total	90	3.235(.543)	3.382(.430)	.147(.404)
	Evaluating	EG1	30	3.280(.451)	3.801(.431)	.541(.410)
		EG2	30	3.332(.521)	3.334(.485)	.002(.435)
		CG	30	3.352(.510)	3.425(.429)	.073(.426)
		Total	90	3.321(.494)	3.476(.448)	.155(.423)

Table 7 also seems to reveal that post-training gains did not change much in the two aspects of self-initiation (range of 3.785 to 3.886 and range of 2.851 to 2.992, respectively). However, post-training gains in EG1 were greater than the other two groups in terms of the three dimensions of self-regulation. The results of an ANOVA are shown in Table 8.

Table 8 shows that the difference for all the self-regulation variables among the three groups were significant ($p < .05$). Table 8 also reveals that differences in self-initiation among the three groups were not significant ($p > .05$). Post-hoc comparisons are shown in Table 9. This table shows a significant advantage of EG1 over the other two groups on gains in three self-regulation variables. However, the advantage of EG2 over CG was not significant.

Table 8. ANOVA for gain scores of LA across three groups

			df	*F*	Sig.
Self-initiation	Reasons for English reading	Between groups	2	.854	.392
		Within groups	83		
		Total	85		
	Making efforts for English reading	Between groups	2	.182	.591
		Within groups	83		
		Total	85		
Self-regulation	planning	Between groups	2	5.216	.010
		Within groups	88		
		Total	90		
	monitoring	Between groups	2	6.489	.002
		Within groups	88		
		Total	90		
	Evaluating	Between groups	2	8.921	.001
		Within groups	88		
		Total	90		

Note. *$P < .05$

Table 9. Post-hoc comparisons of LA gains across three groups

		(I)Group	(J)Group	Mean difference (I-J)	Standard error	Sig.
Self-regulation	planning	EG1	EG2	.401*	.124	.005
			CG	.311*	.121	.004
		EG2	EG1	−.092	.135	.750
			CG	−.401*	.124	.005
		CG	EG1	−.311*	.121	.004
			EG2	.092	.135	.750
	monitoring	EG1	EG2	.392*	.130	.002
			CG	.356*	.109	.015
		EG2	EG1	−.392*	.130	.002
			CG	−.105	.121	.785
		CG	EG1	−3.356*	.109	.015
			EG2	.105	.121	.785
	Evaluating	EG1	EG2	4.582*	.135	.000
			CG	4.850*	.125	.000
		EG2	EG1	−4.852*	.135	.000
			CG	.158	.121	.760
		CG	EG1	−4.850*	.125	.000
			EG2	−.158	.121	.760

Note. * $P < .05$

These findings are consistent with the group interview. The six participants expressed a change in their approach toward online reading with the onset of the training. These participants also revealed that the training had motivated them to reflect a lot during and after reading. One of the participants expressed her ability to focus more on background information, and the manner in which she can use this information to better comprehend the text. The capability to infer the meanings of unknown words was expressed by another participant:

> I paid more attention to the context. This is why I can infer the meaning of some of the unknown words. I used to ignore the embedded information in the context. (Student 1: turn 1, group interview)

In terms of planning, students expressed that they lacked the time to do a lot of planning for their reading exercise. It was also interesting to note that although monitoring was applied less than evaluating, some students had merged monitoring and evaluating. This seems to support the idea that students who received the training had realized the importance of monitoring. As one student stated:

> I began to engage in self-questioning while reading. For example, how is this text organized? Is there a new information here? Am I learning as I read? What do I already know about this topic? Earlier, I used to read without monitoring the process. (Student 2: turn 2, group interview)

As for evaluation, most students associated it with identifying specific deficiencies in building the necessary reading skills. For example, one student noted:

> I began to evaluate the specific errors that I made while reading. This included errors with skipped words, missing parts of the word, and multi-syllable words. (Student 3: turn 3, group interview)

One student, however, said that he checked not only the errors noted above, but also the comprehension skill.

> I began to evaluate how well I have understood the text or the topic. Earlier, I used to read, but forget the main idea after reading. (Student 4: turn 4, group interview)

The students admitted the advantage of online reading. As one student noted:

> This is a new method that can be adopted for improving reading comprehension. I like online reading because it saves time. Due to the convenience brought by online reading, I can reread the new text anytime and anywhere. Most importantly, I know how to practice my reading skills. (Student 5: turn 5, group interview)

Overall, the group interview confirmed the results of the post-exercise questionnaire. The insights of the students during the group interview partly explained why EG1 had an advantage over the other two groups.

4. Discussion and conclusion

Overall, different results in the two main components of LA in EG1 were noticed. Although significant changes in students' self-initiation were not observed, skills related to self-regulation were significantly improved. Similar results have also been found in some previous studies (Gu, 2007; Nguyen & Gu, 2013), and it is evident that Chamot's (2005) CALLA framework is an effective approach for the promotion of LA. This also shows that the learner-driven self-initiation component is more difficult to teach, while self-regulation skills can be taught through a systematic and intentional process. This is important because improvements in self-regulation may link to significant and lasting gains in lexical knowledge.

4.1 Metacognitive strategies training

According to Benson (2001), students' learning is developmental. In this case, their autonomy first begins implicitly and then becomes more explicit. However, the levels at which LA becomes explicit vary from person to person. This is contingent on learners' involvement and cognitive factors. Explicit strategy training may help students heighten their awareness in the planning, monitoring, and evaluating their learning.

The results of this study seem to show that the metacognitive strategy training was a success. This provides insights into teaching. First, students who are expected to become more autonomous in their learning need to exert control over their learning. In fostering EFL learners' LA, the key point is that learners must learn to exercise control and collaborate with teachers for achieving LA and acquiring learning. In a typical EFL setting, teachers make the final decisions regarding the teaching content. In establishing a new but effective EFL context, it is important to first provide a framework within which learners can take an increasing amount of responsibility, which can be facilitated by shifting the responsibility of learning from teachers to learners. Previous studies have also emphasized that the responsibility of deciding the course content should be shared between teachers and learners, and gradually be transferred from teachers to learners (McGarry, 1995; Nix, 2003).

Second, teachers should provide their students a clear picture of their teaching objectives (Driscoll, 2004). In this regard, teachers should make learners aware of what to expect from a particular teaching session so that the students are prepared to receive the information. This practice might contribute towards motivating the students. However, teachers in an EFL context seldom inform their students about their teaching objectives. In the present study, the Session One training provided the students with explicit objectives for using online reading. This may have oriented the students towards the main purposes of using online reading while enabling them to understand the learning goals ahead in the future.

Finally, teachers should describe or demonstrate the strategies involved in using online reading. They should also provide students with opportunities for practicing strategies associated with online reading. In addition, teachers should provide resources to the students for monitoring their learning process and improving their evaluation skills. Previous studies have shown the advantage of practicing strategies and the values of evaluations (Chan, Sprat, & Humphreys, 2002; Natri, 2007).

4.2 Enhanced LA

The self-regulated strategies presented in the current study embody the development of LA among learners. It was encouraging to notice the improved employment of self-regulated strategies among learners, which included planning, monitoring, and evaluating. Based on Coiro and Dobler's (2007) findings, a more complex cognitive process is involved in tackling online texts. The findings in the present study shape and increase our understanding concerning the three self-regulating strategies.

First, although some learners had not exercised planning skills before, they undertook the planning of an online reading task. The learners who possessed some planning skills managed to widen the repertoire of this skill. For example, along with the prescribed content planning, a few learners also planned additional online reading tasks (Student 1: turn 3, group interview). A few learners planned to explore background knowledge related to their reading texts (Student 2: turn 2, group interview), while others executed planning strategies for determining the items that must be processed in the various online reading texts (Student 3: turn 3, group interview).

Second, students in the EG1 engaged the least in monitoring after the training. It strengthened the findings of previous studies, which reveal that the most difficult self-regulation component to teach is monitoring. For example, Sert's (2006) results showed that learners in Turkey were not willing to practice monitoring. Similarly, in a previous study (White, 1995), it was also found that both classroom learners and distance learners did not monitor as much as they planned and evaluated. A few learners spent their efforts monitoring their language problems rather than learning progress, performance, or feelings (Student 5: turn 5, group interview). In addition, some learners were more involved in monitoring the learning of new words rather than monitoring a sequential process of comprehension (Student 6: turn 4, group interview). Bearing this in mind, it is proposed that more training on monitoring should be provided. This may help the students to pay particular attention to monitoring skills during the learning process.

Finally, some participants consulted multiple online resources to verify information they were not familiar with, and expressed that they would continue to evaluate and verify the information until satisfactorily discerning its meaning (student 5: turn 5, group interview). Continuous evaluation is crucial for obtaining accurate

and complete information, which might also contribute towards building a better repertoire of lexical knowledge.

4.3 Enhanced lexical knowledge

Results showed a significant improvement in lexical knowledge for EG1. Similar results were also found in previous studies (Rubin & McCoy, 2008; Teng, 2015a). In addition, Nguyen and Gu (2013) proposed that metacognitive training is flexible and advantageous. Together, these findings suggest that strategy training can be applied to improve learners' lexical knowledge, and it is effective for learners in different settings and of different levels.

4.4 Applying online reading

Previous studies have proposed that learners must tackle different problems and difficulties during online reading than during traditional teaching (Cairo, 2011; Cairo & Dobler, 2007). Findings from EG2 showed that mere exposure to online reading did not produce a significant impact on learners' comprehension capacity. This is due to the fact that online reading exposes learners to limitless information and knowledge that are presented in a non-linear way. However, positive results from EG1 showed that focusing on online readers' use of metacognitive strategies can compensate for this disadvantage. Learners must be instructed on how to plan online reading, locate information, monitor the learning process, and evaluate the usefulness of strategies. This is in line with previous research regarding online reading (Konishi, 2003; Leu et al., 2007; Park & Kim, 2011; Park, Yang, & Hsieh, 2014).

Together with the above studies, the current study showed a pressing need for tertiary-level EFL learners to use a wide range of metacognitive strategies to support their online reading. These included setting goals for online reading, monitoring the understanding of the text, and evaluating the strategies employed during the learning process.

In conclusion, the present study produced three important findings. First, EG1 achieved significantly higher scores in lexical knowledge than the other two groups. Additionally, the improvements in lexical knowledge by learners in EG1 were better maintained. Second, improvements were also detected in the self-regulation aspect of LA, and thus it was concluded that this component is teachable. The present study reveals that planning became the most exercised skill, after training, followed by evaluating and monitoring. However, the students demonstrated the least improvement in the skill of planning and the biggest improvement in the skill of evaluating. Third, focusing on online readers' use of metacognitive strategies can

make online reading more effective. Instructions for online reading should include steps designed to engage students in metacognitive awareness. Given the nature of self-regulation and the findings in this study, it can be stated that strategy training should be more extensively integrated into EFL teaching.

Although a wealth of insights was derived from the present study, there are still some limitations. First, only Chinese EFL students were involved in the present study. Future studies should replicate the research design with larger groups of learners in other contexts. Second, research on comparing more proficient and less proficient learners will help teachers understand ways to help students who are not well-prepared for online reading. Third, future research into the promotion of LA can explore a bottom-up model of metacognitive training. In this regard, the teacher can ask guiding questions to help students plan their targets during the learning process. In this case, the students should not be explicitly instructed about the goals they must set. Finally, these results must be understood in the context of the usual standard error of measurement. This may have been influenced by test-retest effects. However, these limitations do not negate the purpose of the study, which was to explore improvements of LA and lexical knowledge through a learner-based approach of integrating strategy training into online reading.

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Appendix A. Shanbei Reading screenshot

Appendix B. Screenshot of personalized learning progress in Shanbei Reading

Appendix C. Test items (20 words)

Untenable
Scrupulous
Vandalize
Revocation
Suppress
Superfluous
Jubilation
Sovereignty
Retaliate
Enervation
Deprecate
Oppression
Navigate
Insatiable
Isolation
Complacent
Humiliation
Animosity
Fortification
Expedition

Appendix D. Questionnaire

Directions: Each statement is followed by five numbers, 1, 2, 3, 4, and 5, and each number means the following: 1=Strongly disagree, 2=Disagree, 3=Uncertain, 4=Agree, 5=Strongly agree. After reading each statement, circle the number (1, 2, 3, 4, or 5) which applies to you.

Self-initiation (reasons for English reading)					
1. Reading can help me improve my English.	1	2	3	4	5
2. Reading gives me a sense of achievement.	1	2	3	4	5
3. English reading brings enjoyment to me.	1	2	3	4	5
4. I want to seek better education or job opportunities.	1	2	3	4	5
5. I can get information through reading.	1	2	3	4	5
Self-initiation (making efforts for reading)					
6. I read English books independently in a library/self-access center.	1	2	3	4	5
7. I read English books which are not compulsory.	1	2	3	4	5
8. I take notes to increase my understanding.	1	2	3	4	5
9. I read books (materials) about how to become a successful language learner.	1	2	3	4	5
10. I reread texts several times when I feel I do not understand them.	1	2	3	4	5
Self-regulation (planning)					
11. I plan what to do before the reading.	1	2	3	4	5
12. I set my goals as to what to read and in what order.	1	2	3	4	5
13. I think of the amount of time I need to complete the reading task.	1	2	3	4	5
14. I think over essential steps to complete the reading task.	1	2	3	4	5
15. I plan different strategies so that I will understand the texts.	1	2	3	4	5
Self-regulation (monitoring)					
16. I have a way to track my progress along the plan I have set for my reading.	1	2	3	4	5
17. I know when I need to change my strategies.	1	2	3	4	5
18. I analyze whether the solutions work for me.	1	2	3	4	5
19. I check every now and then to see if my purpose of reading has so far been achieved.	1	2	3	4	5
20. If one strategy does not work, I will try another one.	1	2	3	4	5
Self-regulation (evaluating)					
21. I can tell if my strategies helped me or did not help.	1	2	3	4	5
22. I consider the assessment criteria set by teachers to judge how well I have done in my reading.	1	2	3	4	5
23. When I finish reading, I go back to my plan and see if I have achieved my plan.	1	2	3	4	5
24. I critically evaluate the information presented in the text.	1	2	3	4	5
25. I think about what kind of resources worked best for my future reading.	1	2	3	4	5

Appendix E. Post-reading interview questions

1. What did you focus on during online reading? Did you do a lot of thinking during or after the reading?
2. Which skill did you exercise more? Planning, monitoring, or evaluating? Why?
3. What other strategies do you usually use when you read online texts?
4. Why was the strategy easy, or difficult?
5. How do you think of the strategy training?
6. What makes a good online reader?
7. Do you think online reading help you in autonomous learning? Why?
8. Is online reading different from traditional reading? To what extent?
9. Do you think online reading help you in vocabulary learning? Why?

Resumen

Este estudio analiza un enfoque centrado en el alumno basado en la aplicación de la lectura en línea para potenciar la autonomía del alumno y aumentar su conocimiento léxico. La autonomía del estudiante se define en términos de su propia iniciación y regulación. Se dividió a un total de 90 estudiantes de una universidad china en tres grupos iguales. Los participantes del Grupo Experimental Uno (EG1) leyeron en línea, tras recibir 9 sesiones de una hora de duración de prácticas de estrategias metacognitivas. Los participantes del Grupo Experimental Dos (EG2) leyeron en línea sin haber realizado previamente ninguna práctica de estrategias. Los participantes del Grupo de Control (CG) sólo leyeron las versiones impresas de los materiales meta. Los estudiantes del grupo EG1 superaron a los de los otros dos grupos en su capacidad de planificar, monitorizar y evaluar la lectura. La planificación se convirtió en la habilidad más ejercitada, seguida de la evaluación y la monitorización. No se detectó ninguna diferencia significativa respecto a estas habilidades entre los grupos EG2 y CG. Los estudiantes del grupo EG1 fueron también los que más aumentaron su conocimiento léxico y, aunque los estudiantes del grupo EG2 alcanzaron puntuaciones más altas en conocimiento léxico que los del grupo CG, la diferencia no fue significativa. Además, los avances en conocimiento léxico se mantuvieron mejor por parte de EG1 en una prueba posterior. En general, este estudio sugiere que proporcionar a los estudiantes prácticas de estrategias metacognitivas para la lectura en línea es un enfoque efectivo.

Palabras clave: Autonomía del alumno, conocimiento léxico, prácticas de estrategias metacognitivas, lectura en línea

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