The Effect of Mobile Learning on Students' Reading Self-Efficacy: A Case Study of the APP "English Liulishuo"

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Abstract

A number of studies have been conducted regarding self-efficacy in the field of foreign language learning. Yet, with the popularity of mobile learning, research on the relationship between mobile learning and self-efficacy in this field is still limited. To bridge the gap, the study aims to investigate the effects of mobile learning on students' reading self-efficacy, i.e. whether the use of mobile learning can improve students' English reading self-efficacy. A questionnaire is employed to collect data from 294 non-English major students in universities. To survey the effect of mobile learning on students' reading self-efficacy, the data is accessed by the software SPSS 20.0. Results of independent T test demonstrate that for overall students, reading self-efficacy for students who have used the app is significantly different from those who haven't in overall reading skills and in the four dimensions of reading skills, i.e. basic reading skills, applied reading skills, reading task skills, and advanced reading skills. As for students with relatively better reading performance, the results are consistent. However, for students with relatively weak reading performance, the reading self-efficacy of students who have used the app only shows significant differences in overall reading skills and in the two dimensions of basic reading skills and applied reading skills, but shows no difference in the dimensions of reading task skills and advanced reading skills. Finally, practical suggestions for mobile learning and students' English reading are given.

Keywords: mobile learning, self-efficacy, English reading, reading skills

1. Introduction

English as a foreign language (EFL) students in China attach great importance to the improvement of English reading ability. Reading, a significant way of language input, occupies an irreplaceable role in the process of language learning, as English reading skill is the cornerstone of other basic skills such as writing, translation and listening (Lu, 2018).

The reading process for EFL students is multifaceted and complicated. Students' reading performance differs greatly for various reasons. Among the factors resulting in individual differences in reading, the influence of emotional factors should not be ignored (Lu, 2018) and self-efficacy is also a repeatedly mentioned word in the field of foreign language learning. Lots of research has been conducted about English reading performance and self-efficacy, concluding that the higher self-efficacy is, the better students' reading performance will be (Hedges & Gable, 2016; Lee & Jonson-Reid, 2016; Yao, 2015; Zhufu, 2014). It is obvious that the level of English self-efficacy is a very important indicator of students' reading ability.

With the advent of the 21st Century, mobile learning becomes prevalent in language learning due to its many advantages. First, it provides learning materials anytime and anywhere. Thus, people can use their fragmented time to learn through mobile learning, so as to help themselves adapt to social development and achieve self-development (Kukulska-Hulme & Pettit, 2008). Besides, mobile learning can take place across different contexts, with the use of multiple communication methods and channels, in ways that merge social interactivity with personalized and individual learning (Park, 2011). In addition, mobile learning gains its edge due to the lower cost, the gender equity factor, and the ease of accessibility that is inherent in online materials when compared with print materials (Motiwalla, 2007). In China, with the proliferation of mobile phones, mobile learning is widely accepted to learn foreign languages among students. According to a survey, the most used function of mobile learning is to use the English dictionary, record teaching materials, use WeChat to learn interactively and use education software or app (Jiang et al., 2014).

Recently, the interplay between the effect of mobile learning and self-efficacy has gained some attention in various fields, such as the learning of billiard skills (Lin et al., 2021), science (Atwood-Blaine et al., 2019), nursing (H. Kim & Suh, 2018), mathematics (Hung et al., 2014), which conclude mobile learning approach can effectively improve students' self-efficacy in learning skills and acquiring knowledge. However, few studies have focused on the relationship between mobile learning and self-efficacy in the field of foreign language learning and investigate whether mobile learning improves students' self-efficacy. It is necessary to investigate it, as mobile learning has been incorporated into many students' language learning processes and self-efficacy is an important indicator of students' language learning performance, including reading performance. Therefore, this research will take a popular app "English Liulishuo" as an example and aims to investigate the effect of app in non-English students on students' self-efficacy in English reading. Specifically, the study investigates the following two research questions: 1)What is the current situation about university students' use of the app "English Liulishuo"; 2)   Does the APP have an effect on self-efficacy of university students and do the CET 4 grades play a role in the effect? If there is some effect, what dimensions are affected? Through the research, we hope to provide some insights for the effect of mobile learning on students' language learning, especially in the aspect of English reading, and to shed light on further development of mobile learning to help EFL students improve their reading ability.

The structure of the paper is as follows. Section 2 will briefly review some literature on mobile learning, self-efficacy and the interplay between mobile learning and self-efficacy. Next, methodology of the present study will be elaborated. In section 4, the result of the study will be presented and discussed. The final section presents the conclusions and illuminates some implications of the study.

2. Literature Review

2.1 Mobile Learning

Mobile learning, or m-learning has been emerging in recent years. A popular definition of it is that "any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning" (O'Malley et al., 2005). Several scholars have since refined the definition, such as Laurillard (2007), who defined it as "the digital support of adaptive, investigative, communicative, collaborative, and productive learning activities in remote locations which offer a variety of contexts for the teacher to operate in." Later, it was pointed out that due to the rapid revolution in the field of mobile learning and the ambiguity of "mobile", the definition of mobile learning is unclear and can vary among different contexts and academic communities (Kukulska-Hulme, 2009). Despite this, one common theme emerges, i.e. the provision of a learner-centered and flexible learning environment that can allow for knowledge construction, skill development training, and performance support across a variety of locations and contexts (Ally & Palalas, 2011). This environment is supported by the use of mobile devices that allow for direct access to learning materials and other resources, regardless of time and location (Teri et al., 2014). In order to attract users' attention, game-based environments have been also introduced in some mobile learning installations (Schwabe & Göth, 2005).

Mobile learning has been widely accepted in the education field and a wide range of research, which is targeted at different specific subjects, like mathematics and the medical field, was conducted. Most research studies report the positive impacts when using mobile devices (Crompton & Burke, 2018; Kearney et al., 2012). Research on pedagogical impacts of a mobile learning application also shows that mobile learning is effective in promoting students' experience and can reduce the modern pressure afflicting higher education (Teri et al., 2014). Especially, in language learning, it has been argued that it gives full play to the advantage of technological tools in language teaching by integrating mobile learning into it, strengthens the student-centered learning pattern and effectively extends the classroom (Miao, 2016).

2.2 Self-Efficacy

Self-efficacy is described as a personal judgement of "how well one can execute courses of action required to deal with prospective situations (Bandura, 1982). According to Bandura's (1997) socio-cognitive theory, self-efficacy is a good predictor of their performance; besides, self-efficacy is also believed to be a mediating role of influencing people's choice, efforts, anxiety, and perseverance when they are in a task. His theory is widely adopted by researchers. Enactive mastery experiences, vicarious experiences, verbal persuasion and competition in learning environments are found to influence students' self-efficacy level (Chan & Lam, 2008; Van Dinther et al., 2011). In the past decades, many scholars have examined self-efficacy within the scope of foreign language learning, such as the mediating role of self-efficacy in listening, speaking, reading and writing performance (Graham, 2011; Idrus & Salleh, 2017; Li et al., 2013; Zhang & Liu, 2009). It has been found that students in different stages who own higher self-efficacy have higher possibilities to make better English

achievements (Meng, 2017; Tian, 2013; D. Wang, 2014). Besides, self-efficacy is an important indicator of English learning in many aspects such as learning strategy (D.-H. Kim et al., 2015; Wong, 2005), learning autonomy (Heng, 2016) and anxiety (Woodrow, 2011).

2.3 The Interplay between Mobile Learning and Self-Efficacy

Recently, the interplay between the effect of mobile learning and self-efficacy has garnered some attention in different disciplines and fields. Lin et al. (2021) adopted the SQIRC-based mobile flipped learning approach and carried out a quasi-experiment in billiard course, finding that SQIRC-based mobile flipped learning approach can significantly improve students' performance on billiards striking self-efficacy. Atwood-Blaine et al. (2019) found the reciprocal relationship between children's creative self-efficacy and their use of a situated mobile game, i.e. young people with higher creative self-efficacy enjoy playing situated mobile games more and playing a situated mobile game focused on creative activity can help increase creative self-efficacy for participants. Hung et al. (2014) adopted an experiment to investigate the effect of digital game-based learning on students' self-efficacy in learning mathematics and results show that the game-based e-book learning model effectively enhance students' self-efficacy. H. Kim & Suh (2018) focused on the effect of an interactive nursing skills mobile application in clinical nursing practices, and found that nursing students' self-efficacy is improved significantly after using the mobile application.

However, the focus on self-efficacy and mobile learning has eclipsed the studies in foreign language learning, except two studies which show that game-based learning has a significant positive influence on the learners' self-efficacy among elementary school students (Yang et al., 2016), and self-efficacy is a significant predictor of students' performance in mobile learning context (Sun et al., 2015). The relationship between mobile learning and English reading self-efficacy also remained unexplored. Yet it is a subject that deserves our attention, because mobile learning has been a main trend in foreign language learning and many apps including those specific for reading emerge in the market for EFL students, which aims to help EFL students in language learning. Besides, as stated earlier, self-efficacy is a key factor in language performance, such as reading performance. Therefore, it is very important to investigate whether mobile learning improves students' self-efficacy in English learning. Against this background, the paper aims to investigate the effect of the app designed for English reading training on students' reading self-efficacy.

3. Methodology

3.1 Research Context

Based on daily observations, an app for English learning, "English Liulishuo" is widely used and has received a good reputation among university students. The app provides reading trainings, which aims to improve students' English reading ability. It offers articles from foreign newspapers or magazines, such as the economist, the financial times, the New York Times on the daily basis. Meanwhile, every article will be given a detailed explanation about the difficult words, phrases and structure patterns, background information, passage structures and so on. It is also praised for the finely worked clock in strategy, which requires users to read every day and share the achievement with their friends. The present study will take the app "English Liulishuo" as an example to investigate the effect of mobile learning on students' reading self-efficacy.

3.2 Research Subjects

The present study will focus on university students who don't major in English. They are required to take College English Test Band 4 (short for CET 4) to test their English ability. Reading test is an integral part of CET 4. The grade of the reading part is a very important measurement for their English reading ability. To ensure the validity of the research, research subjects that take part in CET 4 within a year will be considered.

To control the variables, students who are selected for completing the survey are all sophomores of non-English majors in a university. They have received similar English education with shared English curriculums and in the same period of time. Besides, those who have only used the app "English Liulishuo" for English reading training more than three months and within one year will be counted as students who have used the app. That's to say, if students used more than one app for English reading training or they used the app "English Liulishuo" more than one year ago or lasting less than three months, they won't be considered.

3.3 Research Instrument

In the presented research, data is collected from one questionnaire. The questionnaire is administered to assess the degree of subjects' reading self-efficacy.

3.3.1 Questionnaires

The first part of the questionnaire involves a background information survey, which collects data related to the participants' gender, grade, university name, major, the time for CET 4 they took part in, the marks achieved in CET 4 and whether the student has used the app or not, when they began using the app and how long they used the app. Later, the following part of the questionnaire is used to assess the degree of university students' self-efficacy about English reading.

In this research, we will use the questionnaire of English reading self-efficacy developed by Wang and Yang (2013). It is designed to measure the English reading self-efficacy of non-English major students. This questionnaire (see the details in the appendix) consists of 22 items that evaluate four dimensions of reading self-efficacy, i.e. basic reading skills (9 items), task reading skills (5 items), advanced reading skills (6 items) and applied reading skills (2 items). Basic reading skills refer to the basic skills needed in the reading process such as silent reading, fast reading, guess words according to the context; Task reading skills refer to skills used for finishing specific tasks such as understanding business letters, web pages and product manuals. Advanced reading skills refer to the advanced skills involved in the reading process such as distinguishing rhetoric devices, understanding authors' emotions, and reading beyond lines to get implicatures. Applied reading skills refer to skills applied to solve specific problems through reading, such as referring to technical articles and finding needed information quickly to solve technical problems. Students specify their agreement on each item, scored on a 5-point Likert response scale from 1 (totally disagree) to 5 (totally agree).

According to the research by Wang and Yang (2013), we tested the reliability and validity of the questionnaire. The overall Cronbach & coefficient test was performed on the scale and the test result was 0.877. In order to further know the reliability index of the scale, the half-test reliability test and the internal Cronbach & coefficient test of each factor are carried out on the scale. The half-fold reliability test is the Cronbach & test for the number of items and the double items. The coefficients are 0.780 and 0.781, respectively. The total scale is extracted by exploratory factor analysis and four factors are extracted. The Cronbach & coefficients of each factor are 0.805, 0.761, 0.735, 0.635.

Studies have shown that learning self-efficacy is positively correlated with academic achievement (Meng, 2017; Tian, 2013; D. Wang, 2014). Therefore, the level of reading self-efficacy of non-English major students should be positively correlated with the grades of CET 4 reading scores of students. If the correlation coefficient is not high, the timeliness of the scale is not high. The results of confirmatory correlation analysis showed that the correlation coefficient between the English reading self-efficacy level of non-English major students and the reading scores of CET 4 was 0.512, which was moderately correlated.

3.3.2 Collection and Analyses of the Questionnaire Data

The data were collected through internet surveys. The questionnaire was forwarded or reposted by the author and the acquaintance.

In order to improve the reliability of the results of questionnaires, students were taught how to complete the questionnaires in detail and encouraged to answer the items with real situations. The questionnaire asks students to answer all questions carefully in an anonymous manner. Time is not limited for question answerings to ensure the accuracy of the results.

The scores of the CET-4 exams are based on the norm reference method and there is no pass line. Each face value of the CET 4 test will be converted to a report score with reference to this norm formula. Each candidate's report score has a corresponding percentile position in the norm group. Therefore, the percentile of scores is checked in the reading part of CET 4 test from the official website. It shows that 50% students score above 170 and 50% students score below 170. Thus, taking 170 as a dividing line, the sample is separated into two groups to show their general English reading ability difference, which can provide different angles to compare the self-efficacy in different groups.

Through carefully data-checking and filtering, the data collected from the questionnaires were input to Statistic Package for Social Science 20.0 (SPSS 20.0). Then a series of analyses were performed for descriptive analysis such as number, frequency, mean, standard deviation, etc. For presenting an overall picture of students' self-efficacy affected by the use of APP, independent-samples T test, for revealing the differences in the level of English reading self-efficacy among different mark groups in terms of the use of APP, was used to assess the effect of APP on students' reading self-efficacy.

4. Results and Discussion

This part presents the results and discussions of the collected data that has been analyzed in SPSS 20.0.

4.1 The Overall Situation of the Participants

294 questionnaires are collected from students. 146 questionnaires, however, were excluded from 294 samples. To ensure the validity and reliability of the research, as mentioned in section 3.2, students who haven't taken part in CET 4 or have taken part in it but more than one year ago are not considered. Meanwhile, only students who have used the app within a year and lasting for more than three months will be considered. Besides, some students are excluded as they were incomplete or failed to follow the instructions. Finally, 148 questionnaires are valid.

Among the questionnaires, 51 participants are males and 97 participants are females; 35 participants once have used the app "English Liulishuo" and 113 participants haven't used the app. The average score of the reading marks among 148 students is 177.43. The median score of the reading marks is 180.

According to authoritarian statistics, the score of the corresponding percentile 50% in the norm group is around 170 marks, indicating that the candidates who achieve a reading score above 170 marks are better than 50% candidates of the norm group. Therefore, taking 170 marks as a dividing line, the whole is separated into two groups. The first group is students who score lower than 170, 49 students in total. The second group is students who score higher than 170, 99 students in total. In the group in which students score lower than 170, 9 students have used the app "English Liulishuo" and 40 students haven't used the app "English Liulishuo". In the group in which students score higher than 170 marks, 26 students have used the app "English Liulishuo" and 73 students haven't used the app.

4.2 Comparisons of Reading Self-Efficacy by the Use of APP

The mean, standard deviation and other information for those who have used the app and those who haven't used the app are exhibited in Table 1, from which the comparison of reading self-efficacy is clearly seen.

Table 1. Independent T test result for the application and reading self-efficacy

	APP	Number	Mean	SD	T	η^2
Basic reading skills	Used	35	36.43	5.05	4.87***	0.140
	Not used	118	30.91	6.08		
Reading tasks skills	Used	35	19.54	3.65	3.73***	0.087
	Not used	118	16.75	3.93		
Advanced reading skills	Used	35	23.43	4.05	4.52***	0.123
	Not used	118	19.95	3.96		
Applied reading skills	Used	35	7.97	1.29	4.75***	0.134
	Not used	118	6.60	1.54		
Overall reading skills	Used	35	87.37	13.06	4.99***	0.146
	Not used	118	74.21	13.80		

Notes. Standard errors are in parentheses with *, **, and *** respectively, denote the 10%, 5%, and 1% significance levels.

Independent T-test was performed to identify if there were significant differences between the reading self-efficacy of students who have used the app and those who haven't. Table 1 indicates that there were significant differences between them for the sampled 148 participants not only in the overall reading skills (t= 4.99, p= 0.00 <0.05, η^2 = 0.146), but also in the dimension of basic reading skills (t= 4.87, p= 0.00 <0.05, η^2 = 0.140), reading task skills (t= 3.73, p= 0.00 <0.05, η^2 = 0.087), advanced reading skills (t= 4.75, p= 0.00 <0.05, η^2 = 0.123), applied reading skills (t= 4.75, p= 0.00 <0.05, η^2 = 0.134). Next, the effect of mobile learning on self-efficacy for different mark groups will be examined respectively.

4.3 Comparisons of Reading Self-Efficacy Whose Marks are Below 170

The students who achieve reading scores below 170 are 49 students, among which 9 students have used the app and 40 students haven't used the app.

Table 2. Independent T test result for the application and reading self-efficacy

	APP	Number	Mean	SD	T	η^2
Basic reading skills	Used	9	33.00	3.32	2.92***	0.154
	Not used	40	27.55	5.34		
Reading tasks skills	Used	9	16.78	4.41	0.86	0.015
	Not used	40	15.55	3.76		
Advanced reading skills	Used	9	20.11	4.26	1.19	0.29
	Not used	40	18.38	3.89		
Applied reading skills	Used	9	7.22	1.20	2.77***	0.140
	Not used	40	6.03	1.17		
Overall reading skills	Used	9	77.11	12.22	2.16**	0.090
	Not used	40	67.50	12.02		

*Notes. Standard errors are in parentheses with *, **, and *** respectively, denote the 10%, 5%, and 1% significance levels.*

Independent T-test was performed to identify if there were significant differences between the reading self-efficacy of students' who have used the app and those who haven't among students whose reading marks are below 170. Table 2 indicates that significant differences exist between them for the sampled 49 participants in the dimension of overall reading skills (t=2.16, p=0.036<0.05, η^2= 0.090). Besides, it is shown that there were also significant differences for the sampled 49 participants in the dimension of basic reading skills (t=2.92, p=0.005<0.05, η^2=0.154) and applied reading skills (t=2.77, p=0.008<0.05, η^2=0.140). However, according to the analysis by SPSS, there were no significant differences in the dimension of reading task skills (t=0.86, p=0.395>0.05, η^2=0.015) and advanced reading skills (t=1.19, p=0.24>0.05, η^2=0.290).

The app teaches students both basic reading skills such as skimming, scanning, guessing words and advanced reading skills such as rhetoric analysis. For students with relatively weak English reading foundation, they only feel more confident in the dimension of basic reading skills, while in advanced skills, students' self-efficacy doesn't differ significantly. It is argued here that as for students whose English knowledge foundation is not so solid, advanced reading skills could not be as easily grasped as the basic reading skills. Advanced reading skills, like understanding rhetoric devices, generalizing or summarizing reading materials, understanding authors' emotions, has a higher requirement for learners' English reading ability i.e. it represents comprehensive competence, which requires students to integrate the reading knowledge they already have. Students need not only to grasp the basic reading skills well, which is a foundation for effectively applying the advanced reading skills, but also to comprehend the overall structures and details of passages, understand culture and background, and grasp other reading strategies. Therefore, students may spend more time on improving their advanced reading skills as well as the corresponding self-efficacy, compared with the aspect of basic reading skills.

The students whose reading marks are below 170 show significantly stronger confidence in applied reading skills after they use the app. The app plays a role in helping students better grasp the general idea of the passage, find the details and get the information they need quickly. It can be explained by the design of the app, which first asks students to get the general idea of the given passage and then leads students to closely read the lines of the passage. In this process, students' self-efficacy of applied reading skills, such as the efficacy in term of finding needed information quickly to solve problems in articles can be approved.

However, for the group with relatively lower reading marks, the reading self-efficacy in the dimension of reading task skills doesn't have significant differences between students who have used the app and those who haven't. Reading task skills generally refer to reading for specific purposes, generally involving some technical genres. As the main teaching material in the app is the news or articles from magazines or newspapers, students don't receive enough training in English articles for specific purposes, such as product manual, advertisement, and invitations. For students who have relatively low English reading ability, they may struggle to apply what they have learned in the materials provided by the app to the unfamiliar materials, when they are exposed to the technical genres. It may provide an explanation for the fact that the extent of confidence doesn't change significantly in the dimension of reading task skills.

4.4 Comparisons of Reading Self-Efficacy Whose Marks are Above 170

The students who achieve reading scores above 170 are 99 students, among which 26 students have used the app and 73 students haven't used the app.

Table 3. Result for the application and reading self-efficacy (above 170)

	APP	Number	Mean	SD	T	η^2
Basic reading skills	Used	26	37.62	5.05	5.68***	0.133
	Not used	73	32.75	5.68		
Reading tasks skills	Used	26	20.50	2.86	3.89***	0.124
	Not used	73	17.41	3.89		
Advanced reading skills	Used	26	24.58	3.34	3.76***	0.174
	Not used	73	20.81	3.76		
Applied reading skills	Used	26	8.23	1.24	1.63***	0.125
	Not used	73	6.92	1.63		
Overall reading skills	Used	26	90.92	77.89	1.57***	0.167
	Not used	73	13.39	1.57		

Notes. Standard errors are in parentheses with *, **, and *** respectively, denote the 10%, 5%, and 1% significance levels.

Independent T-test was performed to identify if there were significant differences between the reading self-efficacy of students who have used the app and those who haven't among students whose reading marks are above 170. Table 3 indicates that there were significant differences between them for the sampled 99 participants in the dimension of overall reading skills (t=1.57, p=0.00<0.05, η^2= 0.167). According to the analysis by SPSS, significant differences also exist for the sampled 99 participants in the dimension of basic reading skills (t=5.68, p=0.00<0.05, η^2=0.133), reading task skills (t=3.89, p=0.00<0.05, η^2=0.124), advanced reading skills (t=3.76, p=0.00<0.05, η^2=0.174), applied reading skills (t=1.63, p=0.00<0.05, η^2=0.125).

The result reveals that students who used the application with reading marks above 170 have stronger self-efficacy in all dimensions, which shows that the app helps students with better reading performance effectively improve reading self-efficacy in reading skills.

Especially, compared to students with lower reading grades, the students with better achievements in the reading test have significantly higher self-efficacy in the dimension of reading task skills and advanced reading skills after they use the app. It is argued that students in this group have higher acceptance for English reading knowledge such as rhetoric devices, and skills such as understanding emotions, grasping general ideas of articles, taught in the app. Therefore, when applying them on the whole to address the reading difficulties encountered by them, students who used the app in this group have significantly higher reading self-efficacy in the dimension of advanced reading skills. Besides, though students don't receive comprehensive training in the app in terms of the reading task skills, students with better English foundation can better deal with unfamiliar materials, i.e. applying their knowledge they gain from the app to other types of reading materials, such as web pages, business e-mail, and technical manual.

5. Conclusion

Through the questionnaire and the analyses of the questionnaire, there are three major findings. Firstly, in general, students who have used the app have better English reading self-efficacy than those who haven't used it. Secondly, for the students whose English reading marks are below 170, there was no significant difference in terms of reading self-efficacy in the dimension of advanced reading skills and reading task skills. But students who have used the app are more confident in the dimension of basic reading skills, applied reading skills and overall reading skills. Thirdly, for the students whose English reading marks are above 170, students in this group are more confident in the overall reading skills, and in the dimension of basic reading skills, advanced reading skills, applied reading skills and reading task skills.

5.1 Implications

The present study shows that we can find that mobile learning does help improve English reading self-efficacy from the perspective of the whole students. As reading self-efficacy shows a positive correlation with reading performance (Meng, 2017; Tian, 2013; D. Wang, 2014), it is sensible to say that the app help students' English learning. Besides, students with higher reading self-efficacy tend to have lower reading anxiety and increased English reading learning motivation (L. Wang, 2014; Zheng, 2005). Self-regulation also works better for students with higher self-efficacy in English learning (Tang, 2020). Therefore, it is of great value to promote mobile learning that can help students improve their self-efficacy in the aspect of English reading in English learning.

Furthermore, the analysis reveals that for students who used the app with weak foundation in English reading, there were still no significant differences in the dimension of advanced reading skills and reading task skills. Therefore, it is advised that future apps can design special training to improve their advanced reading skills and reading task skills for students whose English reading foundation is weak. Specifically speaking, as for reading task skills, the app could design special services to improve students' ability to read genres of different varieties, such as business invitations, emails, product manuals, advertisements and so on. Meanwhile, apps can teach students corresponding strategies to read such type of reading material so that students' reading task skills could be improved. As for advanced reading skills, for students with relatively weaker foundation, the app could set the special class that gives a more basic and detailed explanation regarding knowledge involved in advanced reading skills, such as giving a special training for rhetoric devices, or how to understand the meaning beyond lines, how to summarize the passage, selective reading and so on, so that students could choose classes according to what they need.

5.2 Limitation

It is crucial to point out that a limitation of this study is that the use of the app is not so widespread that the sample of the students who have used the app is not large. Therefore, there exist some deviations. What's more, the present study investigates only the different dimensions of reading self-efficacy levels of students; the reasons for differences of reading self-efficacy levels between different groups are not addressed. Therefore, this research provides a research direction for future studies.

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Appendix A

Questionnaire to English reading self-efficacy

1) I can basically read and understand articles with moderate language difficulty and general topics at a moderate speed (70 words/minute), and understand the main idea and main details;

2) I can read English personal letters or general business letters involving daily life;

3) I can read the general information of English webpages, and filter the information I need;

4) I can read domestic English newspapers and periodicals, and understand the main ideas and main facts;

5) I can read English instructions, such as advertisements, product manuals, posters, invitation letters, etc.;

6) I can read common English forms in life, such as questionnaires, travel information forms, and shopping information forms;

7) I can use the dictionary to read the English textbooks of my major, grasp the main idea, understand the main facts and related details;

8) I can quickly find the required information from English books with the help of dictionaries to solve the professional problems encountered;

9) For the quick reading part of the exam, I can use reading skills proficiently to do questions through skimming and searching (skimming: browse the article roughly to understand the main idea of the article; search reading: find what I need in the article Related information);

10) When reading the article, I can consciously look for the topic sentence of each paragraph to understand the topic and general structure of the article;

11) When reading articles, I can use the "speedless reading method" (visual reading method), that is, I use my eyes to scan the relevant text without reading aloud or silently;

12) When reading, I will consciously mark important places or add comments around;

13) I can understand the logical relationship of context based on the "signal words" of the article (such as the conjunct however, therefore, moreover);

14) For the new words and idioms in the article, I can use guessing strategies (such as using context, roots, parenthesis, common sense in life) to guess the mean.

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