

The Impact of Using a Mobile App on Improving Students' Creative Thinking in Business English Writing with Self-regulated Learning

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Abstract—Creative thinking skills play an important role in Business English writing, but university students are not creative enough due to the overemphasis of knowledge input in traditional Business English writing classroom in mainland China. To solve this problem, this study involves in the mobile learning environment as the medium. By encouraging students to practice various self-regulated learning strategies while studying the learning content designed by referring to Zimmerman's self-regulated learning model and Wen's Production-Oriented Approach via the mobile App *Superstar*, this study aims to promote students' creative thinking skills in Business English writing. Students reported increased self-regulated learning ability after the experiment. It is found that there is a significant positive relationship between online self-regulated learning and creative thinking and students' creative thinking skills are significantly improved in post-test in Business English writing. Among all the nine self-regulated writing strategies, goal-oriented monitoring and evaluation, idea planning, and emotional control are the most important predictors of students' creative thinking levels.

Keywords—creative thinking, mobile learning, self-regulated learning, Production-Oriented approach, Business English writing

1 Introduction

Business English teaching and learning is increasingly popular at tertiary level in mainland China, and Business English writing, as one of the most important components, refers to the writing of Standard English in a business-like way, such as business report, fax, application letter, personal résumé, and business proposal [1]. Since the quality of Business English writing frequently affects the result of job-hunting or international business transactions, it becomes a major concern for English educators. Creative thinking, as one of the 21st century skills, helps students to process new information in a unique way, come up with innovative ideas and shift from different ideas flexibly. Therefore, creative thinking can improve writing quality with the help of writers' cognitive flexibility [2], originality of unique ideas [3], cognitive and metacognitive skills [4], motivation [5] and creative use of linguistic knowledge [6]. However,

the focus on the input of knowledge instead of students' thinking skills in traditional classroom in tertiary education fails to prepare graduates to cope with problems in the workplace [7]. Changes are in urgent need to reform the way of learning and teaching Business English writing. With its multifunction, technology has provided us with new perspectives to foster students' creativity and student-centred mobile learning environment has won great popularity among the young generation.

With the fast development of mobile touchscreen technology, educational instructions are greatly changed [8]. Mobile devices with multifunctional Apps allow the young to operate in natural ways with their instincts [9]. However, many so-called educational Apps are so entertainment-oriented that they are not sufficient to support effective cognitive development [10]. Therefore, educational Apps should be well-designed to facilitate effective learning experience. According to Stamatios, the best design is the one that mirrors students' natural constructive learning process. Based on these assumptions, this study introduces self-regulated learning which helps students to construct knowledge within the zone of proximal development. Besides, it turns mobile environment from a time-consuming way of entertainment into a place of creation [11]. Self-regulated learning has recently been discussed for its effectiveness in fostering personal skills like critical thinking skills [12]. Its positive effect on creative thinking in Business English writing still needs to be tested. Besides, students cannot become highly self-regulated learners automatically in mobile learning environment [13], and self-regulated learning should be performed through students' interactions with teachers and learning environment. In this way, this paper investigates how to help teachers to perform the role as mediators in a systematic way. Therefore, this paper firstly explores the way to design the learning content on a mobile App by referring to Zimmerman's self-regulated learning model and Wen's Production-Oriented Approach to scaffold learners to practice various self-regulated writing strategies and consequently tests the effect of the mobile learning content towards students' self-regulated learning ability and creative thinking skills.

2 Literature review

2.1 Problems with creative thinking in Business English writing

Creativity is one of the most desirable graduate attributes and improves students' competitiveness in the job market. It exists in many fields like literature, music, science, marketing, but no consensus on the definition of creativity has been reached among researchers [14]. Actually, the definition of creativity are domain specific, and it can refer to quite different things in different areas [15]. However, it is widely accepted that creative thinking has two features: novelty or originality and appropriateness or usefulness [16, 17]. It also has two thinking processes: divergent thinking which serves as the core part and convergent thinking [18]. Therefore, this paper holds that creative thinking in Business English writing means the writer considers diversified possibilities and find out proper solutions in the writing to solve a specific business problem and the level of students' creative thinking is assessed based on these features.

Despite its great importance, studies have shown that creativity is declining in China [19] and worldwide [20] with standardized answers easily obtained from the internet. Meanwhile, the lack of creativity in Business English writing may lead to various problems. One of the big problems is that students' writing works are strikingly similar to each other. A study shows that many students download the same format from the internet and replace some of the content with their own personal information when being asked to create their CVs [21]. They even use the same résumé to apply for different positions. This inevitably leads to the failure in job-hunting. According to the preliminary study among the population, when facing writing tasks, students lack the ability to interpret given information from different perspectives, to generate many ideas in the planning period. They frequently rely on the novice writing strategies, such as copying the known information, borrowing others' ideas, and paraphrasing answers from the internet. They also borrow the sentence pattern with slight changes. In the revising period, they are not able to review the writing from the readers' perspective to evaluate the usefulness of the solutions. These problems need to be settled down by educators.

Business English writing, falling into the scope of using English for special purposes, is usually genre-based, which makes it more professional and practical than other types of English writing [22]. Students are usually trained and encouraged to learn how to follow certain rules and conventions instead of being motivated to be creative. For this reason, researchers usually advocate the study of critical thinking and thus creative thinking is neglected [23]. However, business writing usually happens to meet the specific needs and no unified contents can be adopted. Writers should come up with original or relatively new ideas to solve a specific business problem and elaborate these ideas in unique ways to avoid some tired ways of writing, and accordingly improve the effectiveness of business communication. Besides, the overemphasis on conventions and rules for the learning of Business English writing but neglecting students' initiative and creativity will cause the loss of interests and motivation in students. These facts show that creative thinking in Business English writing are important to be studied [24].

2.2 Fostering creative thinking in mobile learning environment

Many studies have been tried to improve students' creative thinking skills. The rapid development of technology brings chances and challenges to solve the problem. Many researches have reported the positive role of internet in learning and teaching process, such as mobile learning [25], blended learning [26] and computer assisted collaborative learning [27]. Among these, mobile learning environment is proved to be more effective in promoting students' creative thinking compared with conventional learning environment [28]. When creativity is defined as the ability to generate original content and demonstrate various ways of thinking, studies have proved that Apps with good design and quality can facilitate creativity for children [29]. One of the reasons is that appropriate apps help students to improve their computational skill, which in turn cultivate students' ability to better express themselves in new and interesting ways [30]. Meanwhile, the easy operation of touchscreens enables

the young with more communication and collaboration [31], because mobile learning environment gives them freedom and a sense of security to express their opinions while the traditional classroom limits their motivation because they often feel embarrassed or frustrated to negative face-to-face feedbacks from classmates and teachers [32]. Besides, well-designed learning Apps or mobile games can arouse learner's interests in combining what they see with their existing knowledge and this process of knowledge construction can lead to subsequent creation [33].

Mobile devices bring vast amount of information and knowledge that can be easily acquired by students. Mobile Apps may also distract students with advertisements, in-app shopping, terrible design and so on [10]. A meta-analysis research checked 22 studies published from 2011 to 2019 and found that many so-called educational Apps actually cannot meet students' learning needs and therefore cannot improve students' learning and intelligence [13]. How to utilize touchscreen technology and make Apps have real educational value is a great challenge for researchers. Some researchers stated that a good educational App must provide active and meaningful learning, engagement in learning process and social interaction [34]. Therefore, self-regulation is involved in this study to provide effective learning experience and thus promote students' creative thinking skills. Many scholars have studied self-regulated learning from different perspective and tried to develop SRL models. Among these models, the ones developed by Zimmerman [35], Pintrich [36], and Winne [37] are the most frequently used. Zimmerman's model was developed and revised from a social cognitive perspective and was used to explore the cognitive activities in the writing process in many studies [38, 39]. Meanwhile, creative thinking is a cognitive process and conscious metacognitive skills are recognized in each stage of creative thinking [40]. Students need to know how to plan, organize, self-instruct, self-monitor and self-evaluate their learning and creative activities. A recent study proves that students' self-regulated learning ability greatly affects their desire to take more online courses [41]. In this case, self-regulated learning is worth further exploration in its effect on creative thinking.

Students cannot practice effective self-regulation when using mobile learning applications without proper interventions. Many studies have been done to show that scaffolds and interventions from teachers are useful to facilitate students' SRL, such as web-based pedagogical tools [42], adaptive SRL systems [11], and well-designed online instructions [43]. The newly developed Production-Oriented Approach, which emphasizes teachers' role as a mediator, provides a new perspective to give support in students' self-regulated learning process. This approach is brought forth by a Chinese educator Wen [44], which involves motivating, enabling and assessing. It helps to develop a learning-centred classroom and creates a favourable atmosphere where students can decide how to learn and have more active participation [45]. Since it is specially designed to cope with current English education in tertiary level in China and emphasizes the output from students, it is quite fit for the current study.

2.3 Theoretical framework

Based on the literature review above, the theoretical framework discussed in this paper is shown in Figure 1.

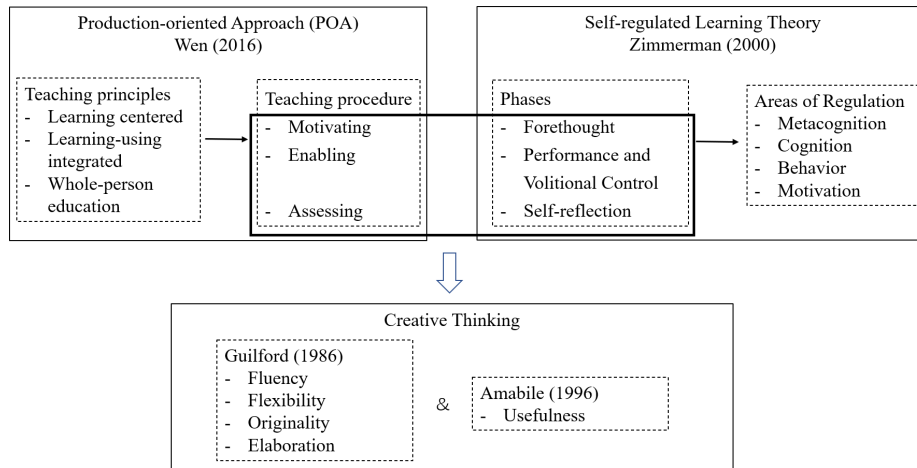


Fig. 1. Theoretical framework for fostering creative thinking skills

The Production Oriented Approach is developed to cope with the segregation of input and output in English education in mainland China, which incorporates the advantages of Western instructional approach and the Chinese contextual features [46]. This approach adopts a learning-centred principle and stimulates students to output by enabling them with the input under teachers' mediation. It focuses on improving students' cognitive performance as well as their autonomous learning ability with three phases of motivating, enabling and assessing, which makes it sufficient as an intervention to improve students' ability to regulate their learning and writing process in Business English.

Compared with OBE, another popular teaching methodology in China, POA gives educators a detailed guidance for how to give instructions in English teaching whereas OBE just provides the basic principles and inexperienced educators often fail to use OBE in the teaching process. The most special part about POA is the motivating part. Firstly, Teachers should design writing scenarios with high communicative values. Four factors, which are the writing topic, the purpose of writing, the identity of the writer and audience, the occasion where the writing is needed, should be described clearly to fully motivate students to generate the productive work [47]. Meanwhile, the initial trial to write the task, which serves as the warming-up activity in students' learning process, helps students to figure out their learning gap instead of just getting them well-prepared for the following enabling activities [48]. This serves as an indicator for students to regulate their whole writing process which may improve their autonomous learning ability in online learning environment.

Self-regulated learning, which is developed and later improved by Zimmerman [35], consists of forethought, performance and volitional control and self-reflection as shown in Figure 1. These three phases work perfectly in students' English writing process which includes planning, writing and revising. SRL is cyclical and requires students to select proper SRL strategies to interact with the personal, environmental and behavioural factors and accordingly to regulate their metacognition, cognition, behaviour and

motivation. By metacognitive and cognitive strategies, students monitor and control their cognition and process useful information and knowledge needed for achieving the learning goal [38]. By social-behavioural and motivational strategies, students try to regulate their learning behaviours and put efforts in keeping the willingness and motivation in fulfilling the learning task. In this study, nine self-regulated writing strategies are set as the indicators of students' self-regulated learning ability in Business English writing, which are text processing, course memory, idea planning, goal-oriented monitoring and evaluation, peer learning, feedback handling interest enhancement, motivational self-talk and emotional control [38].

In this study, creative thinking involves two parts, which are divergent thinking and convergent thinking. Divergent thinking contributes to reflect novelty while convergent thinking makes the product useful. For divergent thinking, four aspects listed by Guilford [18] are considered: fluency, flexibility, originality and elaboration. This focuses on students' ability to generate original and various ideas and demonstrate ideas of various types in the writing process, and it also requires students to creatively use their linguistic knowledge to elaborate their ideas. For convergent thinking, it refers to the usefulness and appropriateness of the ideas [49], and the writing should give proper solution for the business problems. The two processes are supplementary to each other. Without convergent thinking, divergent thinking may become a wild run of one's imagination, while without divergent thinking, one cannot come up with the best answer.

Under this theoretical framework, mobile learning environment works as the medium for students' learning activities and teachers' mediation. Teachers design scenarios based on the real-life cases which are of high communicative values in a mobile App to motivate students to try out the writing task creatively. Students plan the writing work, set up goals, and search for relevant information via the App to find out the problems and gaps they must overcome to generate creative ideas. Then teachers help to provide necessary scaffold to enable students by appropriate input and support their writing process. Teachers then select some writing samples to show how to assess and ask students to carry out self-assessment or peer assessment. Students finally revise their writing based on the feedback. All the activities are carried out with a mobile App, with teachers' mediation to intervene students' self-regulation in the writing process. The ultimate learning goal is to compose original, novel, and useful writing to help solve problems in a specific business context.

2.4 Research questions and methodology

This study adopted a One-Group Pre-test and Post-test pre-experimental design which was quantitative to test students' levels of self-regulated learning and creative thinking, and further explore the relationships between the two variables. Forty-eight second-year undergraduates majoring in Finance in Hebei Finance University were selected as the samples of this study. For these samples, Business English writing is the only English class they need to learn for the whole semester. All the students are required to use the mobile App *Superstar* to finish all the learning activities. This App is very popular among the samples, and they are also required to use it for the learning

of other subjects in Hebei Finance University. Therefore, the operation of the App is not a problem that may affect the current research. Based on this design, the current study aims to answer the following questions:

1. What is the effect of the mobile App learning content by referring to POA and SRL model towards:
 - i) students' levels of self-regulated learning in Business English writing
 - ii) students' levels of creative thinking in Business English writing
2. What is the correlation between self-regulated learning and creative thinking in mobile learning environment in Business English writing?
3. How to cultivate and predict students' creative thinking in Business English writing based on self-regulated learning in mobile learning environment?

To answer these questions, the experiment is implemented with the following steps. At the beginning of the experiment, the students were given the instruction of self-regulated learning and the strategies they can use in Business English writing process. After the preparation, the pre-test started. The pre-test includes two parts. Students were firstly required to finish the Writing Strategies for Self-regulated learning Questionnaire (WSSLQ) [38] to assess their levels of self-regulated learning. Then the students were asked to finish an open-ended Business English writing task on *Superstar* App. Students' writing was assessed by three judges who are experts in grading Business English writing under the guidance of Consensual Assessment Technique (CAT) [15] to measure students' creative thinking skills. After the pre-test, Students were asked to write four Business English writing tasks on the App within the duration of eight weeks of treatment.

Figure 2 shows the navigation screen for Business English writing on the App. In the navigation page, students have a clear picture of each writing tasks. Students can get access to the learning content via the App anytime and anywhere. Meanwhile, *Superstar* App allows students to have both private chat and group chat with their classmates and teachers. Students can initiate a discussion or reply to other's discussion during the learning process. This gives students a safe place to have effective social interactions.

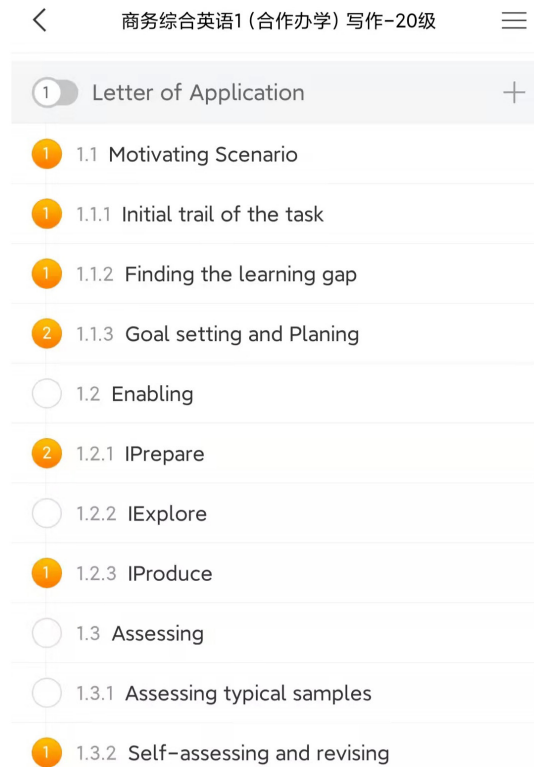


Fig. 2. Superstar App screen for navigation

Teacher's intervention was reflected in the design of the learning content. As mentioned above, the learning content was designed based on the guidance of POA. Therefore, the most special part in motivating session is the design of writing scenarios and initial trial of each writing task. All the four writing tasks were specially designed to motivate students. Figure 3 shows the detailed description of writing task 1 of the treatment. It clearly shows the writing purpose and occasion where the writing is needed. It also gives students a vivid image of who they are and who the readers are. In enabling session, the input and output activities were designed from less challenging to more challenging to gradually help students be more ready for the final productive work. For assessing, teacher-student collaborative assessment is used based on POA to give students support on how to revise and improve their written work. Apart from the design of learning content, the teacher monitored and supervised students' learning through the App by checking students' learning record via the teacher's account. In addition, the teacher designed questions and checklists for students to remind them of using SRL strategies like goal setting, task understanding and idea planning in the whole writing process. These checklists work as a kind of scaffold to enabling students practice self-regulation in the whole writing process. The teacher gave feedback and helped to assess when it was necessary. The post-test was given after the treatment to reassess students' levels of self-regulated learning and creative thinking skills.

Task 1



Scenario: You are surfing the Internet and looking for job vacancies. Suddenly, you see an recruitment advertisement of your desired position (such as Financial Planner, Accountant, Financial Analyst, Business Teacher, etc.) from a multinational company. You read very carefully about the job description and requirement and you make some notes while reading. You really would like to apply for it. Please write a letter of application to the person to contact by referring to the notes you've made.

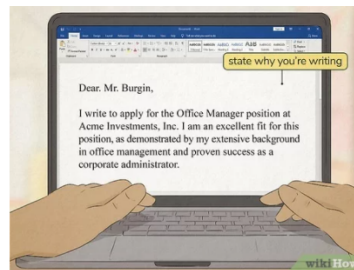


Fig. 3. Superstar App screen for Business English writing task 1

Data were analysed in two ways. First, descriptive analysis was used to show students' levels of self-regulated learning and creative thinking. Second, inferential analysis was done where Spearman's Correlation and Paired samples t-test were used to test the correlation and effect. Finally, the decision tree analysis was done to find out how to cultivate and predict students' creative thinking skills since decision tree is a popular way to make predictions and help to improve adaptive e-learning systems [50].

3 Results and discussion

After data collection, the statistical analysis was carried out via SPSS program.

To answer the first research question, the research assessed students' levels of self-regulated learning in Business English writing in mobile learning environment to see if there is a great difference from pre-test to post-test. Table 1 shows the descriptive analysis of students' levels of self-regulated learning in mobile learning environment in pre-test and post-test. The tables show that the median is 205 in pre-test while the median is 237 in post-test, which indicates students' ability to regulate their learning activities in mobile learning environment was improved after the experiment under teacher's intervention.

Table 1. Descriptive analysis of self-regulated learning in pre-test and post-test

	N	Median	Minimum	Maximum	Percentiles		
					25	50	75
Pre-test	48	166	96	265	151	166	188
Post-test	48	230	162	279	201.25	230	247.5

Table 2 shows the test statistics of the Wilcoxon Signed Ranks Test. The significant value p is 0.000, which is lower than 0.05. This means there is a significant difference between pre-test and post-test of students’ SRL levels. It proves that students have made a significant progress in their self-regulated learning ability with the help of the learning content on *Superstar App*.

Table 2. Wilcoxon Signed Ranks Test statistics of SRL pre-test and post-test

	Post-test – Pre-test
Z	-4.498*
Asymp. Sig. (2-tailed)	.000

Note: *Based on negative ranks

All the statistical results show that students reported improved self-regulation. One of the reasons might be due to the design of the learning content by referring to the SRL model from Zimmerman and Production-Oriented Approach. Previous studies reported high dropout rate of online learning courses [51], because students rely highly on parents and teachers to improve their learning outcomes in traditional learning environment and when being moved to mobile learning environment, they suddenly lose the support and often feel lost and less motivated. The current findings show that teachers’ intervention in designing the learning content plays an important role in improving students’ levels of self-regulated learning. This finding is also supported by Wen [46] that POA is beneficial for students to improve their autonomous learning ability. Similar findings were reported in a systematic review which studies 38 articles published from 2007 to 2019. It is found that students’ self-regulated learning ability can be enhanced if educators provide proper support and scaffolding when integrating mobile learning with SRL [52].

Next, students’ levels of creative thinking in Business English writing were also assessed to test the changes between pre-test and post-test. Table 3 illustrates the descriptive analysis of creative thinking in pre-test and post-test. There are forty-eight students in each of the test. The mean score is 19.58 in pre-test, lower than the mean score, which is 29.69 in post-test. This indicates students’ level of creative thinking in post-test is higher than that in pre-test on average.

Table 3. Descriptive analysis of creative thinking scores in pre-test and post-test

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test	48	11.00	30.00	19.58	4.819
Post-test	48	20.00	37.00	29.69	3.942
Score difference	48	2.00	23.00	10.17	

To check the effect of the mobile App learning content towards creative thinking, paired samples t-test was done after the Shapiro-Wilk normality test proves the scores in pre-test and post-test were all normally distributed. From Table 4, the significant value p is 0.000, which is lower than 0.05. This means there is a significant difference between pre-test scores and post-test scores. This proves students have made a significant progress in their creative thinking skills in Business English writing after the treatment of the mobile App learning content.

Table 4. Paired samples t-test of creative thinking scores in pre-test and post-test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Post-test – Pre-test	10.1042	4.28873	.61902	8.85885	11.34948	16.323	47	.000

With the significant improvement of students creative thinking ability, a meta-analysis by using Cohen's d formula was calculated to show the effect size. By dividing the mean difference by the standard deviation in Table 4, the value for Cohen's d is 2.36, which is greater than 0.8. This means the effectiveness of the treatment is large in the current research. Similar finding was also founded that students' creative performance in art and design can be enhanced by forstering students' self-regulated learning in higher education settings [53].

To answer the second research question, which is to examine the correlation between self-regulated learning and creative thinking in Business English writing, Spearman's correlation coefficient was calculated. The result in Table 5 shows that Spearman's correlation coefficient is 0.755. It is greater than 0.6, smaller than 0.8. Besides, the significant value p is 0.000, which is smaller than 0.05. The results indicate a strong positive relationship between self-regulated learning and creative thinking in Business English writing. Many studies also proved the significant positive correlation between self-regulated learning and creative thinking in math [54], between self-regulated strategies and creative outcome like fluency and flexibility [55].

Table 5. Spearman's correlation between students' self-regulated learning and creative thinking in post-test

			SRLpost	Post-test
Spearman's rho	SRLpost	Correlation Coefficient	1.000	.755**
		Sig. (2-tailed)	.	.000
		N	48	48
	Post-test	Correlation Coefficient	.755**	1.000
		Sig. (2-tailed)	.000	.
		N	48	48

Note: **Correlation is significant at the 0.01 level (2-tailed)

Finally, decision tree analysis was done to check how to cultivate and predict students' creative thinking ability in Business English writing by self-regulated learning. As discussed above, there are nine self-regulated writing strategies in Business English writing process. By analysing students' usage of these writing strategies with J48 which is a popular algorithm in WEKA, the decision tree shows the most typical way to get above-average level of creative thinking scores. The decision tree shows more than 20 students who got more than 26 in goal-oriented monitoring and evaluation, more than 15 in idea planning and more than 17 in emotional control get above-average level of creative thinking. When students have a clear goal for writing, their metacognition becomes more active to monitor and evaluate the writing process. They may utilize all possible means to generate novel ideas in idea planning and express them in their unique way to make the writing useful for certain business context. Similar finding was found to show the importance of subprocesses of SRL in improving students' performance in online learning environment [56]. Meanwhile, the importance of emotional control in creativity is also supported in a recent study which proves that students' efficiency and creativity can be increased when they show positive emotions [57]. Therefore, to increase students' creativity in Business English writing, instructors should give effective scaffolds in their mobile App to help students plan their ideas, keep positive emotions and monitor their writing process to stick to the right path.

4 Conclusion

As creative thinking skills become increasingly important for university graduates, integrating technology in the teaching and learning process to improve students' creative thinking skills is the challenge that should be overcome by educators. This paper firstly tried to explore the theoretical framework that can be used for fostering creative thinking and then carried out the experiment to test its effectiveness. The results show that with teacher's proper interventions, students can be highly self-regulated in mobile learning environment. There is a significant positive correlation between students' self-regulated learning and creative thinking skills in Business English writing when students are using the mobile App. With the frequent use of self-regulated writing strategies, students' creative thinking skills can be greatly improved. Therefore, the theoretical framework proposed in this study can enlighten university educators for further test. However, this study also has its limitations. The experiment was carried out in only one university in Hebei Province, China and it involves only a small population. This greatly limits the findings to be generalized to a larger population in other learning subjects. Moreover, an adaptive self-regulated learning App with the guidance of Production-Oriented Approach is worth being designed and produced to promote creative thinking.

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