Investigation of Multiple Recognitions Used for EFL Writing in Authentic Contexts

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Abstract. Recognition technologies had been prevailing and widely used for EFL learning. We investigated the different recognitions used for EFL writing based on image-to-text, translated speech-to-text, and location-to-text recognitions – ITR, TSTR, and LTR. A quasi-experiment was implemented for 12 weeks in a vocational high school with experimental and control groups in two stages. Pre-test, posttests 1 and 2, questionnaires, and interviews were conducted and analyzed. Experimental learners, who wrote writing based on ITR and TSTR, outperformed control learners who wrote that based on TSTR only. Also, the experimental learners, who wore writing based on ITR, TSTR, and LTR, outperformed the control learners who wrote that based on ITR and TSTR. Particularly, LTR was beneficial for identifying controlling ideas and addressing the writing topics. ITR was beneficial for brainstorming and generating more ideas. TSTR was beneficial for yielding and transferring writing contents into words. The multiple recognitions were beneficial for most EFL writers, especially for low-ability language writers. Most writers were interested in describing based on authentic context learning. However, they complained about the low accuracy of LTR and TSTR and the difficulty of ITR texts when writing. Accordingly, the LTR database with various categories of places, the generation of ITR based on the language abilities of learners, and the higher accuracy of TSTR should be strictly considered when applying multiple recognitions for EFL writing.

Keywords: EFL writing Recognition technology Multimedia learning · Adaptive technologies

1 Introduction

1.1 Motivation

English as a foreign language (EFL) is the most popular language in the world and EFL writing is a challenging skill [7, 12]. EFL writing is a difficult skill that should be

supported [3, 10, 26]. Writing requires transforming thoughts into words and understanding lexical density, sentence complexity, and grammatical accuracy [26]. Furthermore, EFL students often encounter difficulties to generate ideas and face problems to structure paragraphs or essays in their writing [3]. In other words, EFL writing requires the learner to have higher skills in using various vocabulary terms, correct sentence patterns, conventional grammar rules, and appropriate writing structure. Therefore, enriching students' vocabulary, understanding various sentence patterns, and being good at writing organization could improve EFL writing.

1.2 Related Works

Recognition technologies extract information from signals, analyze it, and then convert it into recognizable outputs [2, 22]. The recognition technologies are based on the diversity of input representations and applied widely for EFL learning like speech voices [8, 11, 21], images [20, 23], body motion, facial statuses [9], current location [19, 27], and so on. Accordingly, STR recognizes English speech and then converts those into English texts [16]. It could enhance EFL vocabulary and reduce the cognitive load when listening to EFL lectures [6]. TSTR is based on STR and translated texts of the target language. Accordingly, TSTR generates EFL texts based on the native language which is beneficial for brainstorming in writing [13]. Image-to-text recognition (ITR) was used to facilitate EFL vocabulary acquisition [23], and to describe descriptions in authentic contexts learning [20]. Moreover, location-to-text recognition (LTR) technology helps learners to enrich vocabularies related to the environments surrounding learners like plants, flowers, trees, and other ones [4, 27]. Therefore, the integration of TSTR, ITR, and LTR texts can be helpful for EFL writing.

The prior studies applied authentic context learning (ACL) for EFL writing and gained some success [7, 12, 14, 20]. Writing in authentic contexts motivated learners to describe more thoroughly and meaningfully, and attracted them to immerse themselves in real-life situations without limitation of time and places [7, 12, 20]. They also found that students could write more vivid words, facilitate them to share more experiences, and enhance their confidence to use English when learning with the authentic learning system [20]. Without doubts, authentic learning is beneficial for EFL writing and would be maintained in this study.

To sum up, the prior studies pointed out that EFL writing is a challenging skill, and ITR, TSTR, and LTR technologies are beneficial for EFL learning. Also, multimedia learning representations attract learners and hold them to learn better, and positively influence English learning. Authentic learning allows EFL learners to immerse themselves in real-life situations that help them learn better. Therefore, we integrated all the features into our learning system, and we expected that it would be useful for EFL writing learning. In this study, we focused on the affordances of the recognitions for EFL writing. According to an experiment, two questions would be answered and discussed deeply in this study:

1. What are the influences of multiple recognitions on EFL writing (RQ1)?
2. What are the perceptions of learners about different recognitions (RQ2)?

2 Instrument and Implementation

2.1 Instrument

We created an app that integrated three recognition technologies including TSTR, ITR, and LTR functions, respectively. The app was based on authentic learning. Accordingly, it allowed learners to immerse themselves in real-life situations to learn EFL writing. TSTR function generates English sentences based on Chinese speech inputs. ITR function generates English vocabularies, phrases, and sentences based on the image inputs. LTR function generates English vocabulary and phrases based on the current location of the user.

The TSTR function (Fig. 1): Learners input their voices or speech in Chinese. Next, the function converted those into Chinese texts. Finally, the function translated the Chinese texts into English texts and showed them on the screen.

Fig. 1. Translated STR function

The ITR function (Fig. 2): This function generated nouns, adjectives, and the other vocabularies which are close to the people, things, and features related to the images. Moreover, it generated some phrases and sentences that described the main contents of the images. This function allowed learners to capture many images for each writing; therefore, the generated texts would be more based on the images. Writers could edit the texts, too. The yellow vocabularies were presented that they belong to the vocabularies in their English textbook and should pay more attention to learning. The generated vocabularies were connected to an online dictionary which allowed learners to listen to the pronunciations and to know the means and the examples of them.

Fig. 2. ITR texts generation

LTR function (Fig. 3): LTR texts are names, addresses, and types of places like schools, libraries, banks, restaurants, stores, and so on which were provided by Google place API. We also added more nouns, verbs, adjectives, and phrases related to 10 common categories with the writers and the writing topics including libraries, classrooms, schools, gyms, restaurants, stations, and hospitals. The added texts had been gathered from learners' English textbook.

Fig. 3. LTR texts generation

2.2 Implementation

We experimented at a vocational high school in Taiwan. One EFL class with 34 eleventh-grade students (16 or 17 years old) participated in our experiment. Both groups used the app but different functions in each stage. Two groups were the experimental group (EG) (N ±7) who learned with both TSTR and ITR in stage 1 and then learned with TSTR, ITR, and LTR in stage 2, and the control group (CG) (N = 17) who learned only with TSTR in stage 1 and learned with TSTR and ITR in stage 2. Each stage had two topics and each topic was learned in two weeks. Four topics were "My classroom", "My campus", "My favorite place", and "Where I am". Pre-test, post-tests 1 and 2, and questionnaires 1 & 2, and interviews were conducted. Posttests 1 and 2 were conducted at the end of stages 1 and 2 respectively. There were 12 weeks in this experiment. A rubric was used to evaluate writing tests based on reasoning, organization, communication, and conventions [7, 20]. Two language experts scored the tests and the Kappa value was $0.845 > 0.81$, $p < .001$. It implies that the inter-rater reliability was perfect and the test could be used to analyze in the next steps. Two questionnaires, which were used for each stage, were conducted with three aspects including ease of use (EOU), usefulness (UF), and intention to use (ITU) [1].

3 Results and Discussion

3.1 Comparison of the Learning Achievement Between Experimental and Control Groups

The analysis of the pre-test showed that no significant differences between EG and CG concerning the total pre-test ($t = -.307$, $p = .761$) that consisted of reasoning ($t = -.317$, $p = .754$), organization ($t = -.333$, $p = .741$), communication ($t = -.375$, $p = .710$), convention ($t = -.134$, $p = .895$). The results implied that both groups were not different in EFL writing before the experiment.

Homogeneity of the score in post-test 1 ($F = 1.291$, $p = .264 > .05$) and the related aspects were not violated ($p > .05$); therefore, ANCOVA analysis was employed. The result of ANCOVA (Table 1) showed that there was a significant difference between the groups concerning the total post-test in stage 1. The experimental students who learned with both TSTR and ITR outperformed the control students who learned with only TSTR concerning total score, communication, and convention aspects. The ITR texts are not only vocabularies like nouns, adjectives, and the other ones related to the objects, people, and things in the input images but also phrases and sentences are described the main content of the images. In addition, an online dictionary was connected to and supported learners to listen to the pronunciations of most ITR vocabularies. The pictorial and verbal representations are useful for memory working [17]. Especially, the pictorial representation helps learners to transfer the learned texts into their long-term memory which is beneficial for EFL vocabularies acquisition [23]. In addition, the pictorial representations had played an important role in stimulating the descriptive contents while the ITR vocabularies and phrases could work as the ingredients to make various sentences in their writing. The use of ITR text could force writers to recall and apply their knowledge about EFL writing; therefore, they would make sentences more

carefully and fluently. Prior research also pointed out that authentic learning facilitates EFL learners in generating more ideas and organizing their writings more logically [3]. Consequently, the learners described more contents, more ideas, and more appropriate vocabularies which are related to the communication and conventions aspects. This result is supported by the past research which found that ITR facilitated EFL writers to describe more meaningfully and thoroughly [20].

Table 1. The ANCOVA results of post-test 1 & 2

Stage		Group	Mean	SD	Adjusted mean	SE	*F*	η^2
1	Post-test 1	EG	3.82	1.15	3.87	0.23	6.009*	0.162
		CG	3.13	1.32	3.09	0.23		
	Reasoning	EG	3.88	1.27	3.92	0.27	2.522	0.122
		CG	3.35	1.41	3.31	0.27		
	Organization	EG	3.88	1.41	3.93	0.29	3.380	0.076
		CG	3.24	1.52	3.19	0.29		
	Communication	EG	3.88	1.17	3.93	0.24	7.242*	0.011
		CG	3.06	1.30	3.01	0.24		
	Convention	EG	3.65	1.06	3.67	0.21	7.619*	0.010
		CG	2.88	1.27	2.86	0.21		
2	Post-test 2	EG	4.46	0.48	4.32	0.12	4.366*	0.123
		CG	3.84	0.81	3.97	0.12		
	Reasoning	EG	4.71	0.47	4.63	0.12	12.427**	0.001
		CG	3.94	0.75	4.02	0.12		
	Organization	EG	4.65	0.49	4.54	0.16	2.070	0.160
		CG	4.12	0.99	4.22	0.16		
	Communication	EG	4.47	0.62	4.32	0.17	1.958	0.172
		CG	3.82	0.95	3.98	0.17		
	Convention	EG	4.00	0.61	3.82	0.14	0.613	0.440
		CG	3.47	0.94	3.65	0.14		

Note: *$p < 0.05$, **$p < 0.01$.

In terms of homogeneity of post-test in stage 2, we found that homogeneity of post-test ($F = .040$, $p = .842$) and the related aspects were not violated ($p > .05$); therefore, ANCOVA was used to analyze. The ANCOVA analysis (Table 1) showed that significant differences between EG and CG groups were found concerning total post-test 2 ($F = 4.366$, $p < .05$). These findings indicated that the EG outperformed the CG in the total post-test of stage 2, especially concerning the reasoning aspect. LTR texts are English vocabularies such as name, address, category, and the other ones of the location. In

addition, some nouns, verbs, adjectives, and phrases which were based on the learners' English textbook and were close to the category, were also provided for learners. LTR mechanism wittingly forces learners to move to different places to learn; therefore, they immerse themselves into various situated learning contexts. Learners can approach the objects, plants, people, or atmospheres surrounding them based on sight, hearing, smell, taste, touch, and feel. Based on the situated learning theory, when learners are engaged in authentic contexts, their knowledge is constructed or produced based on social interactions that take place in the surrounding contexts [26]. In addition, the scenarios are mostly related to place descriptions; therefore, those LTR texts can be useful for the writers to state the main subject and controlling idea in the topic sentence or to name the related places as the subjects or objects in their supporting sentences. For example, the writer was at a park, and LTR texts were "new park basketball court leave station position go out run see …"; consequently, the learner made a description "This is a new park basketball court. A lot of people will play here. Especially on holidays, there will be a lot of people. It has outdoor venues and sheltered venues. Every time I pass by here, I see a lot of people playing there". Another one, the writer was nearby an elementary school, and LTR texts were "Hsih Shin elementary school Xinshi park climb up down go way slide educate teach instruct pull stop …", Consequently, the student's description was "This is the outdoor playground in Hsih Shin elementary school. Sometimes, there are many people playing basketball outside the classrooms. The gate is very splendid. The teachers are knowledgeable. The school can make me learn hard.". Hence, LTR is beneficial for addressing the topic and directing controlling ideas in descriptions related to the scenarios.

3.2 Effectiveness of Multiple Recognitions on EFL Writing

Pearson correlation was used to analyze the effect of the multiple recognitions on post-test 1 and 2. We found that the use of ITR vocabularies significantly influenced on the improvement of the aspects related to vocabulary acquisition like communication aspect in post-test 1 (r .590, $p < .05$) and the conventions aspect in post-test 2 (r .494, $p < .05$). Moreover, ITR phrases significantly influenced on the various of sentences in post-test 2 (r =.516, $p < .05$). The result ties well with the prior finding that ITR is useful for EFL vocabulary acquisition [23]. TSTR significantly influenced on the number of sentences in post-test 1 (r =.611, $p < .05$). Prior research also pointed out that the translated English text based on writers' native language was convenient and useful for them to brainstorm and yield more words and sentences [13]. The use of LTR text did not influence the aspects in the post-test 2. The result implied that ITR had played an important role in EFL writing concerning the aspects related to vocabulary use while TSTR was useful for yielding more sentences. The clear influence of LTR use should be investigated further thus.

3.3 Perception Toward Using Multiple Recognitions for EFL Writing in Authentic Learning

For questionnaire 1, the Cronbach alpha value was 0.965 for 16 items in both groups, and that was 0.940 for all 20 items of EG in questionnaire 1. For questionnaire 2, the Cronbach alpha value was 0.958 for 23 items in both groups, and that was 0.961 for all 27 items of EG in questionnaire 2. Table 2 shows that all the aspects in stage 2 are better and better than those in stage 1 in both groups. It implies that the participants tended to satisfy when learning with more recognition. For EFL learning, the redundancy issues had not been found in EFL learning [15]. Therefore, multiple recognitions have a big potential in EFL writing.

For feedback, the TSTR function has got negative feedback related to the low accuracy (e.g., "The translation function is very good, but it cannot directly improve my English ability" (S01-2.25-3.50-4.75: Student ID-pretest-posttest 1- 2); "The sentences from the translation department are sometimes not accurate" (S03-2.00-4.50-4.50); "TSTR text is sometimes not accurate" (S05-3.00-4.25-4.25); "…the translation function (TSTR) can be used most of the time, it is impossible to distinguish English ability" (S33-2.00-4.00-4.25)). It also has positive feedback related to its usefulness (e.g., "I think the system is doing very well, especially TSTR and ITR, which have very useful functions…" (S19-0.50-4.00-3.75); "most people use the translation function" (S30-4.50-4.25-4.5)). The perceptions revealed that TSTR texts could be more useful for low student abilities, but the accuracy may be its main problem. The ITR function was also useful for low students (S19), but its phrases and sentences were sometimes difficult to use with them (S04-0.50-4.75-4.25). Also, another student complained about the LTR accuracy (e.g., "…But I think LTR sometimes does not detect the location accurately(S19).") which showed the limitation of the LTR readiness in EFL writing in this study. The small database of the place categories and a lack of innovative technology support could be the main cause of LTR limitation in this study.

For learning activities, almost students gave positive feedback about the authentic context learning (e.g., "very fulfilling" (S01); "allowing us to write outdoor" (S09-2.75-4.75), "diverse activities and very efficient" (S11-4.5-4.75), "allowing me to learn a lot of English knowledge"(S16–1.5–2.5); "We have learned a lot of English sentences and vocabularies and learned from the activities without being bored" (S29-0.0-2.0); "experiment is very fun, I can learn English and go out in the park"(S35-3.5-3.5)). The results revealed that authentic context learning attracted EFL learners, especially low students, and helped them to improve their EFL writing skills.

Generally, for users' perceptions, both ITR and TSTR texts are useful for EFL writing; however, many ITR texts are still difficult to apply to their writings. TSTR and LTR texts are sometimes incorrect and irrelevant to the context contents of the locations, but TSTR is helpful for low language ability students. Authentic learning should be used for EFL writing to attract the attention of writers.

Table 2. TAM questionnaire results in stages 1 & 2

		Easy of use		Usefulness		Intention to use	
		Mean	SD	Mean	SD	Mean	SD
Stage 1	EG	3.68	0.31	3.20	0.26	3.25	0.25
	CG	3.59	0.71	3.27	0.83	3.07	0.68
Stage 2	EG	3.71	0.33	3.54	0.12	3.33	0.14
	CG	3.66	0.63	3.44	0.86	3.26	0.83

4 Conclusion

For RQ1, both ITR and TSTR are beneficial for EFL writing concerning the communication and conventions aspects which were related to the use appropriate vocabularies and making more meaningful sentences while the LTR is beneficial for EFL writing concerning the addressing writing topic and controlling ideas. The combination between ITR and TSTR is beneficial for EFL writing because ITR facilitates to transfer of the learned texts into learners' long-term memory which is of paramount importance to working memory [17, 23] while TSTR facilitates to convert the ideas into the target language more efficiently. LTR facilitates addressing the topics and controlling the ideas in EFL writing related to the scenario. Without doubts, ITR and TSTR can improve the local aspects of EFL descriptions while LTR can improve the global aspects of those. For RQ2, students tend to satisfy when learning with multiple recognitions. They thought that ITR and TSTR are useful for EFL writing, but some limitations should be improved. ITR can be useful for their imagination and generating more ideas while TSTR can be useful for yielding more words and sentences, especially for the low language ability writers. However, many ITR texts were difficult and advanced for them to use while the low accuracy of TSTR and LTR should be improved. In brief, multiple recognitions open more opportunities for EFL writing and have a big potential in this field.

The small sample, short time experiment, and the problems related to low accuracy of LTR and TSTR were the limitations of our study. We scoped the description paragraphs which should widen other topics and contexts used to practice EFL writing. Although LTR has a big potential in EFL writing, it should be investigated further near future. ITR texts should be refined to meet the needs of different language ability writers. TSTR should be improved with higher accuracy.

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