



Can an automatic essay scoring system be used to improve students' writing skills?

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Abstract

An automatic essay scoring (AES) system used to be developed to assess students' writing abilities in a test. However, it is recently used in the classrooms to improve students' writing skills. Pigaiwang, an automatic essay scoring (AES) system, is widely used in China's English writing classrooms. In this study, 56 participants are chosen from three English classes to write an essay by using Pigaiwang in order to find out how Pigaiwang enhances students EFL writing performance and how the teacher applies the big data gathered from Pigaiwang to their teaching of English writing. The study demonstrates that the pigaiwang can promote and improve students' writing ability by providing resourceful and useful feedback and the teachers can use the big data gathered from the Pigaiwang in their English writing classrooms.

Keywords: automatic essay scoring, AES, pigai system, english writing

1. Introduction

Automatic essay scoring (AES) refers to the assessment and scoring of an essay by using the computer (Page, 2003) [6]. The earliest AES research and piloting dates back to the 1960s (Wang, 2005) [9]. From then on, there appeared a surge in the research and development of AES and more than 10 systems has been developed (Muncie, 2002) [5]. The typical systems are PEG (Project Essay Grade), IEA (Intelligent Essay Assessor) and E-rater, all of which have their own characteristics. PEG is the early system, which only assesses the level of writing through analyzing the language characteristics of an essay (Larsson, 2009) [3]. IEA mainly focuses on the content of an essay, while E-rater focuses not only on the content but also the form or structure of an essay (Attali & Burstein, 2005) [1]. Criterion, a branch of ETS, has developed a system called Online English Writing Practice, which can provide students a holistic rewarding score and an analytic report within 20 seconds after submitting an essay. It means the AES can be used to facilitate students' writing practice in addition to assess them.

However, these systems provide students feedback and scoring of their writing based on English as mother tongue, which means they are not totally suitable for Chinese students, who use English as second language (EFL). Therefore, last decade witnesses a surge of developing online AES system in China. The most widely used online AES system in China is Pigaiwang Essay Scoring and Correction System (abr. Pigaiwang) developed by National Language Intelligence Center of China, which is based on statistics, natural language processing and artificial intelligence. According to its website (www.pigai.org), more than 220 million essays have been assessed by Pigaiwang.

After Pigaiwang developed, it has already aroused interests and attention of scholars in China (He, 2013; Yang, 2015; Zhong, 2015) [2, 10, 11]. A series studies have been conducted, which mainly focuses on the reliability and validity of the

system (Shi, 2012; He, 2013; Yang, 2015; Zhong, 2015; Lu, 2016) [8, 2, 10, 11, 4]. There still lack studies into how to use this system in the teaching activities, especially in the EFL process writing, because Pigaiwang is not only able to be used as scoring instrument, but also facilitate and improve student's English writing (Yang, 2015; Zhong, 2015; Lu, 2016) [10, 11, 4]. The purpose of this study is to explore the possibility of using Pigaiwang as a way of teaching and practicing EFL process writing in China.

2. Research Questions

1. How does Pigaiwang enhance students EFL writing performance?
2. How does the teacher apply the big data gathered from Pigaiwang to their teaching of English writing?

3. Research Design

The study of EFL Process Writing by Using Online Automated Essay Scoring System is designed as follows:

Participants

60 senior high school students in Grade 1 are selected randomly from 3 classes, all of whom attend the researcher's English lessons. But 4 of them failed to meet the requirements of the study. Therefore, 56 students have participated in the study. 26 of them are male students; the other 30 are female students, and their English writing level varies from ordinary, good to excellent according to their enrollment test results. In addition, all of them are adapted to writing through Pigaiwang and willing to participate in this study.

Research plan

All the 56 participants will write an essay "Commenting on the saying "Listening is more important than talking" by using Pigaiwang. They can cite examples to illustrate the importance of listening and should write at least 120 words but no more

than 180 words. But the most important thing is that with the feedback from Pigaiwang they should rewrite or modify their essays more 3 times within a month. It means their writing should go through the following steps: brainstorm, draw an outline, the first draft, the second draft and the final essay. It is referred to as process writing and often used as the methodology of choice on writing courses in EFL countries (Muncie, 2002) [5].

4. Findings and Discussion

Principles of Pigaiwang

In Pigaiwang, students' essays are regarded as a learner's corpus, and the score of every essay is composed of 192 dimensions. By comparing the students' essay and standard corpus, the gap measured by the mapping is transformed into scores, remarks and feedback of students' essays. The scoring process is like a teacher assesses the student's essay from multiple dimensions, such as type/token ratio, spelling, length of words, length of sentences, number of clauses, etc. gives an overall feedback and comments on sentences, and points out the existing problems at the same time. In addition, the teacher can give an online assessment or correcting of the student's essay based on the system prompt. The principle of Pigaiwang is illustrated in Fig. 1.

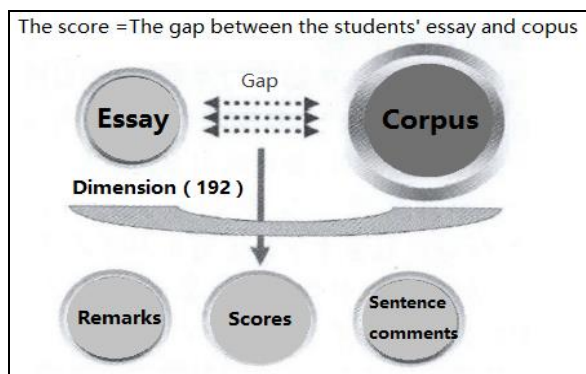


Fig 1: Principle of Pigaiwang (from Pigaiwang's publication materials)

Fig. 1 shows us three kinds of feedback given by Pigaiwang, this is, remarks, scores, and sentence comments. At present, there are 15 different categories of corpus, the phrase library of which is 3.3 billion, and the corpus is used to update every day. Through the "perfect essay" function, the students

Modify the essay in accordance with the "comments on each sentence". The modified essay is submitted to system once again for real-time assessment and scoring and so repeatedly, guide students' writing, until the best. In the whole process of writing, Pigaiwang plays a role of writing teachers.

Students' Performance

In this part, students' performance is to be demonstrated by the figures provided by the Pigaiwang. And these figures can be used by the teachers in the writing classrooms. Fig. 2 shows the distribution of students' scores given by Pigaiwang, which demonstrate an approximate normal distribution. Most students' scores are distributed around 85, because the researcher set the task a little easy. The purpose of doing so is to reward students with high scores, with the hope of encouraging students to use the system to practice essay writing through Pigaiwang. In this system, the teacher is able to set the expected average, maximum and minimum scores for different levels of students or at different learning stages, which is very useful and helpful.

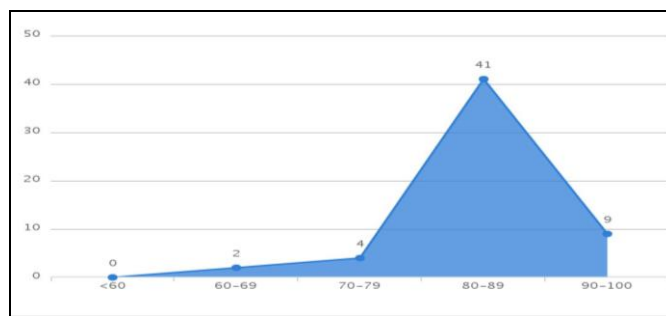


Fig 2: Distribution of students' scores given by Pigaiwang

Table 1 demonstrates the students' performance in the Piagaiwang essay writing. The average score is 84.1, which means the students' writing is fairly good. The average modification times are 45.2, because the students are asked to submit their essay after every modification. Usually, students will make several modifications at one time, the modification times is not so high. By modification, every student improved their original scores by the average 10.4, ranging from 4 to 13. This improvement is significant for it proves that through practicing writing in Pigaiwang, they learned how to modify and improve their essay, which is very useful skill and then improve their writing ability.

Table 1: Students' Performance in the Pigaiwang essay writing

	Scores (total 100)	Words	Modification times	Improved scores	Similarities
Average	84.1	168.2	45.2	7.4	8.5
Max	94	228	165	13	42.5
Min	60	110	1	4	0
Std Dev.	28.2	5.7	18.9	3.9	18.7

Table 2 demonstrates the students' mistakes made in the Piagaiwang essay writing. Six types of mistakes are frequently mentioned, that is, spelling, collocation, verb mistakes, noun mistakes, wrong word usage, and wrong sentences. The

teacher can make use of this statistic figures to help students identify the mistakes and try to avoid them next time. In the Piagaiwang, some versions of suggested modification are provided for the students.

Table 2: Students’ mistakes made in the Pigaiwnag essay writing

Types of mistakes	Numbers	Typical examples	Suggested modification
Spelling	1	Only when we fought did she realize it\'s wrong.	fighted → fought
Collocation	2	All in all, nothing can instead of listening!	instead of → replace or take the place of
Verb mistakes	2	Finally, we break out a fight which I told her try to listen to others.	add “to” before “try”
Noun mistakes	4	listening is a sign of complement.	complement → compliment
Wrong word usage	4	Personly, respect is a demonstration of virtue...	Personly → Personally
Wrong sentences	18	But the views of people on it varies from person to person.	varies → vary
Total	31		

Table 3 demonstrates the frequency of vocabulary usage in the Pigaiwnag essay writing. The most high frequently used vocabulary are some function words, such as to, the, a, etc. However, the most significant is the use of academic words, in

that they are more sophisticated and difficult to learn. Usually, they are passive words. The students should try to use them in their writing, which will improve their English writing greatly.

Table 3: Frequency of vocabulary usage in the Pigaiwang essay writing

High-frequency vocabulary	Numbers	Sub-high frequency vocabulary	Numbers	Academic vocabulary	Numbers
to	453	conversation	15	communication	23
is	338	firmly	8	significant	20
the	312	prefer	8	acknowledged	10
listening	235	satisfied	7	significance	9
of	221	skill	6	denying	9
a	192	attention	6	focus	8
in	177	avoid	6	role	7
we	173	improve	6	communicate	7
and	172	information	5	enhance	7
that	170	lot	5	achievement	6

Improvements of students’ writing

More important of writing in the Pigaiwang is that students can improve their writing by modifying under the help of feedback from the Pigaiwang. Fig. 3 shows the changes of one

student’s score after modifications, which is increasing although there are some fluctuations, for some modifications will

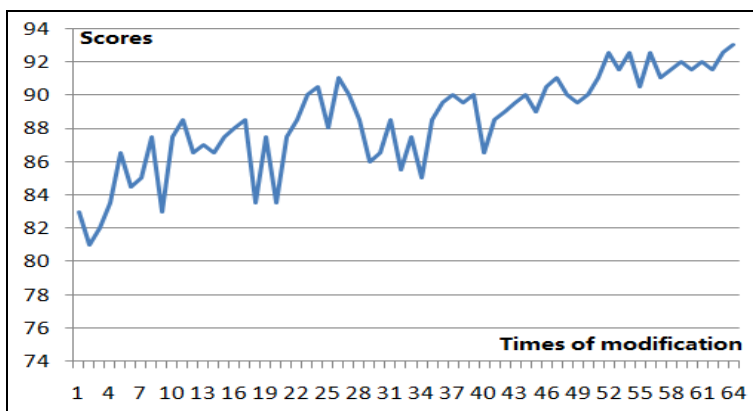


Fig 3: Changes of one student’s score after modifications

Table 4 demonstrates the track of modification of one student’s writing according to the feedback from Pigaiwang. By the modification, the scores is increasing a little, which

means the Pigaiwang can help students modify and correct their own writing, therefore improve their English writing ability.

Table 4: Track of modification of one student’s writing in the Pigaiwang essay writing

No.	Original	Modification	Feedback from Pigai	Scores
1	Relative to the said,...	Relative to say,...	The use “to the said” is wrong.	75
2	...listening to others talk patiently is a kind of respect for the speaker.	...listening to others’ talking patiently is a kind of respect for the speaker.	Check the agreement of “talk”.	75
3	so I think listening reflects a kinds of respect...	so I think listening reflects a kind of respect...	The spelling of “reflects” is wrong.	77

4	On the other hand, listening can give the speaker a sense of freedom.	On the other hand, listening can give the person who is speaking a sense of freedom.	The wrong use of “speaker”.	78.5
5	If your good friend feels depressed	If your good friend feels depressed	Pay attention to the spelling of “friend”.	80
6	listening is the most direct way to get to know each other in our process of getting along with people.	listening is the most direct way to get to know each other in our process of getting along with others.	Pay attention to the difference of “people” and “person”.	83
7	Such as, if your good friend feels depressed	For example, if your good friend feels depressed	Check the use of “such as”	84.5

5. Conclusion

In this study, 56 participants are chosen from three English classes to write an essay “Commenting on the saying “Listening is more important than talking” by using Pigaiwang in order to find out how Pigaiwang enhances students EFL writing performance and how the teacher applies the big data gathered from Pigaiwang to their teaching of English writing. The study demonstrates that the pigaiwang can promote and improve students’ writing ability by providing resourceful and useful feedback and the teachers can use the big data gathered from the Pigaiwang in their English writing classrooms.

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