

Research Article

Improved Collaborative Filtering Automatic Assessment System for Teaching English Writing in College

Lu Zhang 

School of English Language and Literature, Xi'an Fanyi University, Xi'an 710105, Shaanxi, China

Correspondence should be addressed to Lu Zhang; zl_8583@163.com

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In the context of economic globalization, as an international language, English plays an increasingly essential role in the communication and exchange of ideas. As an output skill that fully reflects one's linguistic and cultural literacy and logical thinking ability, English writing is undoubtedly the most difficult of the four basic skills of listening, speaking, reading, and writing. Writing is a form of expression that enables human thoughts to communicate and exchange across time and space, and it is also a powerful witness to the collision of ideas. However, most college students treat English writing with contempt. The reasons for this situation are related to the traditional teaching methods and assessment methods of English writing in universities. After all, today, many universities focus on the development of learners' input skills or on the training of translation skills in the workplace. However, the development of English writing skills is weak. As a result, a great number of learners' English writing skills lag behind other skills. This is because, for many years, the English writing curriculum and teaching mode in universities have only emphasized students' learning of passive language input and rarely highlighted the importance of language output skills and activities. As a result, the imbalance in the interaction between language input and output has led to a lack of students' writing skills. The teaching model of college English writing is mostly that teachers teach the theory and skills of writing through model essay analysis, and then, they are responsible for assigning writing tasks. The new standards promulgated by the Ministry of Education in 2001 also clearly state that the evaluation system should reflect the diversity of evaluation subjects and the variety of evaluation methods. In other words, both outcome evaluation and process evaluation should be considered. The focus of formative assessment is on students' learning process. The evaluation content focuses on students' performance, emotions, attitudes, and learning strategies in the learning process. The subjects of evaluation are teachers, students, and peers, which coincide with the requirements of the new curriculum reform. After more than 20 years of lightning-fast development in the Internet era, China's Internet industry has achieved unprecedented success and is playing an unprecedented role on the world stage. Under the guidance of relevant policies, China is steadily moving toward becoming a cyber power. Education is the main means of training talents in China, but the traditional teaching mode is bounded by time and place. Therefore, teaching through the Internet is convenient and unconstrained in this era. In addition, the convenient connection of mobile Internet anytime and anywhere has facilitated the rapid integration of online and offline education. Education, as a future-oriented business, is bound to bring about a change. In this study, an improved collaborative filtering automatic assessment system for teaching English writing in college is designed.

1. Introduction

With the trend of economic globalization and the promotion of reform and opening up, English has become increasingly popular as a global language [1]. At the same time, the requirements for people's English mastery are gradually increasing. In contrast to the increasingly stringent

requirements of society, the English proficiency of contemporary college students is below social expectations, especially in writing [2]. As an output skill that reflects one's overall English language skills and logical thinking ability, writing ability is considered to be the most important of the four basic skills that can highlight one's overall English language ability. After all, a person's language skills can only

be reflected in his or her writing skills [3]. A great piece of writing is not only a blossoming of ideas on paper but also a pleasing arrangement of characters [4]. To be specific, an excellent piece of writing requires correct formatting, strict structure, fluency and precision, and the ability to accurately reflect the author's inner views and attitudes. In contrast to the importance of writing, the English writing of today's college students is not as good as it should be [5]. Specifically, their attitude toward writing is rather negative. No one sees writing as an outlet for their emotions or as an expression of their independent thinking skills [6]. On the contrary, they see writing as a burden for homework and a chore for thinking. The root cause of students' poor attitudes toward writing is strongly related to the traditional English writing education in universities [7]. As one of the required core courses, English writing serves to train students in basic English language skills. This course is designed to enhance students' English language skills and promote the formation and development of their English professionalism [8].

The achievement of teaching goals is based on the educator's reasonable control of the teaching process and the scientific monitoring of teaching quality [9]. The teaching of English writing should be based on the requirements for the quality of English teaching, and the process of writing teaching should be controlled and evaluated. Writing has always played a very essential role in the development of students' English language proficiency [10]. As one of the activities that reflect the development of students' overall English language skills, its quality affects not only the development of students' overall language quality but also the teachers' judgment of students' English language proficiency [11]. As a result, teachers should pay attention to the role of English writing in promoting learning and make the quality of English teaching specific, operational, and practical in terms of the process and method. To be specific, English language teaching should be judged by the quality of English writing in the university in terms of the requirements for the training of English majors [12]. On the one hand, it can establish the external training objectives for English writing teaching. On the other hand, it can also provide implicit implementation guidelines for writing teaching [13]. Writing in the English major requires a high level of language proficiency. As one of the most important forms of English language output, the level of writing can reflect the student's overall language and thinking skills to some extent [14]. As a result, English writing is particularly vital for students' overall English language development. For this reason, English writing has always occupied an important place in front-line teaching [15]. Teacher feedback is an important part of English writing instruction, helping students to review and revise their own texts. In other words, it has a crucial role in the development of students' English writing, which in turn affects the quality of English writing instruction [16]. Most of the current research on teacher feedback focuses on error-correcting feedback, and it has been discussed theoretically based on the question of feedback effectiveness.

As we all know, writing English is one of the most difficult aspects of learning a foreign language, yet it is one of

the language skills that modern society requires learners to master [17]. This is because the process of writing is an important way to develop students' ability to assimilate, process, and integrate language information, practice their understanding of language rules and regulations, and improve their overall language skills [18]. The composition section is often one of the least scored questions in the English IV and VI exams. The reason for this is that there are different approaches and models of teaching writing that are commonly used in China and abroad, although each has its own essence and rationality [19]. However, since most of the research is focused on students with a high level of English proficiency, it needs to be tested whether these methods are still applicable to today's large number of application-oriented college students with basic English proficiency. The combination of scaffolding, word blocking, modal theory, and constructive theory with writing instruction tends to focus on the input of language [20]. Students are writing for the sake of writing, and the process is mostly based on passive language input, with a single output method. The process of absorbing, internalizing, and consolidating knowledge is essential to improving the effectiveness of writing. In relation to the actual teaching of English writing in China, especially the teaching of English in college, which is mainly for training application skills, students need to master the basic skills of the English language such as phonetic knowledge, basic vocabulary, and grammatical knowledge, which have been mostly learned in secondary school [21]. After entering university, the focus of study should shift from acquiring English language knowledge to cultivating comprehensive language application ability. In other words, the focus of the study should shift from the input-oriented stage of English language in secondary school to the interactive and balanced stage of English language input and output in college [22]. As a result, the traditional English writing classroom teaching, which focuses on input skills training, is not conducive to optimizing learners' language knowledge learned in secondary school, nor does it meet students' needs for communicating in English, nor is it conducive to the development of students' future employment skills.

In recent decades, China has seen rapid development and the emergence of new industries [23, 24]. Under the Internet boom, the traditional education industry has also been gradually integrated with "Internet+" under the promotion of government policies [25]. As a result, online teaching platform based on the personalized recommendation algorithm has become the preferred mode for Internet users as a new teaching mode. This has attracted great attention from society and relevant education departments. The application of collaborative filtering algorithms to online teaching platforms plays a significant role in improving user stickiness [26]. Personalized recommendation systems were introduced as a separate concept in the mid-1990s. In the past, as the personalized recommendation was widely used on shopping websites and followed by news websites, personalized recommendation algorithms were rapidly developed in various fields of the Internet [27]. With the promotion of smart education, domestic scholars have

also realized the important role of personalized recommendation, and the research on personalized recommendation systems and online teaching has become more and more mature [28]. In order to improve user experience, enable users to conduct multiple studies on the same platform, avoid time and space troubles, and improve students' learning efficiency, along with the rapid development of Internet technology in recent years, significant achievements have been made to realize the perfection of online teaching platform functions and the improvement of user experience, making the online teaching system more perfect.

In the national environment of advocating "Internet+," education informatization has been upgraded to the policy level of "building a strong education country." Smart campuses and "Internet + education" are also included in the specific implementation plan, which means that substantial policy benefits fall on online education [29]. With the guidance of national policies and information technology development, the future development of China's education largely depends on smart education. While the mobile Internet era has facilitated daily life, it has also generated a large amount of data and information [30]. The vast majority of the dazzling variety of recommendation systems available today are used in the commercial sector. In contrast, there are relatively few recommendation systems in education. Under the dual pressure of work and study, the realization of personalized recommendation of educational resources has become the primary problem to be solved in smart education. The application of personalized recommendation systems can effectively solve the problem of cognitive overload or disorientation when users learn online and can greatly improve resource utilization and user learning efficiency. With the importance of personalized learning, a personalized recommendation based on a recommendation algorithm provides a good opportunity for the development of personalized learning.

The purpose of this paper is as follows. First, it is to explore an effective college writing teaching model applicable to cultivating applied skills and talents. Second, it is to explore how to organically combine language various ability development and writing in writing teaching of college English. To be specific, the organic combination of audiovisual tasks and writing training is conducive to the revitalization of language knowledge, oral expression, and written expression, in particular, how the organic combination of audiovisual tasks and writing training can help to revitalize language knowledge, how the organic combination of oral expression and written expression can help to internalize language knowledge, and how the organic combination of reading and translating ability development and writing training can help to consolidate language knowledge. Third, according to the principle of close integration of language input and output, we try to upgrade the writing teaching mode which is based on language input alone. In other words, the writing process will cover the three stages of input, output, and interaction and implement a multimodal language input, language-output-driven, and language-multiform interaction model.

2. Framework of Assessment System for English Writing

2.1. Demand Analysis. Under the current traditional education model in China, English writing in college is basically taught in the classroom. Students are taught mechanically, not caring whether they have digested and understood it or not, and are taught in their own way. In addition, students are accustomed to receiving this knowledge under this long-term model. As a result, they are rarely able to engage with the teacher in the classroom. This model is extremely boring and does not place the students as the central subject, thus neglecting their ability to write on their own initiative, resulting in a uniformity of writing. After students submit their writing assignments, teachers usually use a subjective holistic grading method and try to correct as many linguistic defects as possible in the essays before sending them back to the students when the work is completed. Since teachers take more time to correct essays, students usually receive teacher comments late and are not impressed with their essays. Therefore, information technology should be used in the classroom to improve the quality of teaching English at the university level. Thus, it seems that the development of using this method to improve the quality of teaching English writing in college has become inevitable.

The survey on the current situation of college English writing teaching can provide a comprehensive understanding of the current situation of college English writing teaching. This study reveals the problems in teaching English writing in college and provides a basis for improving English writing teaching in college. In this study, questionnaires were distributed using a questionnaire star to undergraduate students in four non-English major classes at a university. In this study, 280 questionnaires were distributed and 242 questionnaires were collected. Among them, the results of the survey about the problems in students' English writing are shown in Figure 1.

From the result in Figure 1, it can be seen that about 44.38% of the students think that they have problems in making sentences in English, and 39.87% of the students think that the content of writing is the biggest problem that affects their English writing. Similarly, sentence formation and writing content are also the main problems that affect college students' writing. However, only 34.55% of the students think that the structure of the text is the most important problem affecting their writing. This is related to the age and perception of college students, who have a better grasp of the whole text and the structure of the text. In terms of feedback on their writing, students expect more attention from their teachers, who will review and revise their English writing several times. In our current English writing instruction, the time available for classroom writing instruction is limited. As a result, teachers are not able to review and revise each student's writing in detail in class. This affects students' motivation to write to a certain extent. At the same time, it is difficult for college students to find out the shortcomings of their own writing and to improve their English writing ability fundamentally.

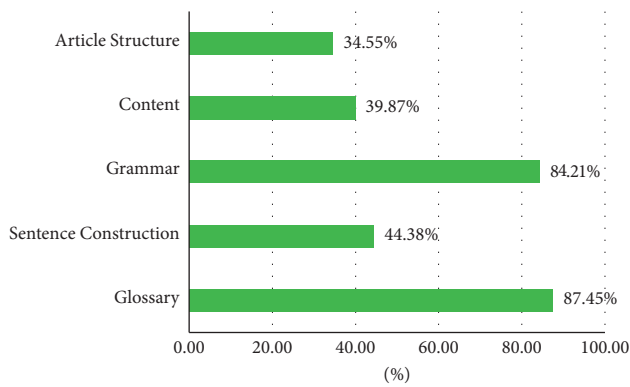


FIGURE 1: Survey about the problems in students' English writing.

2.2. Application Base Analysis. Based on the analysis of the characteristics of the English subject and the current situation of English writing, this study designed the application of an automatic evaluation system for teaching English writing in college based on the differences in cognitive styles. The whole teaching process follows the application concept shown in Figure 2.

The design of the application centered on students' cognitive style differences reflect the learner-centered design concept on the one hand. On the other hand, English teaching is closely related to students' cognitive styles. The learner-centered design concept can help learners choose the appropriate English writing teaching strategies based on their own cognitive styles. In this way, the automatic evaluation system can be better applied in the teaching of English writing in college. In addition, this study takes a dynamic perspective to measure learners' English writing. The study focuses on learners' writing process throughout the English writing instruction. With the automatic assessment system's recording function, the process of individual learners' changes should be considered throughout the application. To be specific, the focus is on the number of revisions, the richness and accuracy of vocabulary and sentences, and the performance of the learners. Only in this way can we gradually improve learners' self-efficacy in the writing process and ultimately achieve the goal of improving their English writing skills.

The design of the teaching environment in this study consists of two parts: the hardware environment and the software environment. The hardware environment provides a multimedia teaching environment for learners, which enables teachers to teach writing content in the classroom and learners to use the automatic assessment system for English writing in the classroom. The software environment is mainly represented by the automatic assessment system and learning support. The learning support includes communication tools and English dictionaries for learners to communicate and collaborate in class. By enhancing the design of the writing environment, the writing teaching process can be integrated inside and outside the classroom. This can help students to learn English writing in an independent and personalized way and brings teachers and students closer together. In this research, the system development environment is illustrated in Table 1.

2.3. Multicomponent Writing Instructional Model. In the design of a real-time interactive English writing teaching model based on a self-action scoring system, the constructivist theory is an important foundation. The process writing approach is based on constructivism, which places the student at the center of the process and emphasizes the importance of the student's role in teaching and learning. The teacher, guided by this theory, should no longer be the provider of knowledge, but rather the organizer of the teaching process, guiding and assisting students to construct knowledge. To be student-centered, teachers must guide students to internalize their knowledge and strive for self-feedback. The process of the multicomponent writing instructional model is illustrated in Figure 3.

Throughout the writing process, students experience the use of writing skills and improve their linguistic knowledge through the abovementioned multifaceted interactive processes and ultimately through the internal construction of self-interaction. The students then gradually integrate and internalize the language knowledge and writing skills to improve their writing skills and achieve the goals of writing instruction.

2.4. Application Element Analysis. The content of the course is designed and arranged by the objectives of college writing and develops the basic English writing skills of college students. According to the teaching objectives and common English writing genres, narrative, descriptive, and argumentative essays are taught in order to make students proficient in writing these types of essays. The English writing instruction in this study is based on an automatic evaluation system. The automatic evaluation system breaks the time and space limitations of traditional writing instruction and provides a possibility to solve the problems that emerged in the preliminary investigation. The process of teaching English writing in this study is shown in Figure 4.

This study examines the application of automatic assessment systems in English writing from a cognitive style perspective. Therefore, it is essential to consider cognitive styles in the application process. Learning support is a combination of teacher support and software environment. Teacher support means that learners can communicate directly with the teacher about their writing problems in the classroom, and the teacher provides support to learners related to the content of the writing instruction.

3. Collaborative Filtering Algorithm

3.1. Framework of Algorithm. Traditional collaborative filtering algorithms recommend items to English learners that are liked by users with similar ratings. This algorithm is simple and easy to implement, but it does not consider the evaluation behavior behind the user's rating data. For example, for English writing recommendations, some users write their own comments and express their feelings after learning. Some users just rate and do not post comments. Some users, as English learning enthusiasts, are stable in the long run and study for a relatively long period of time each

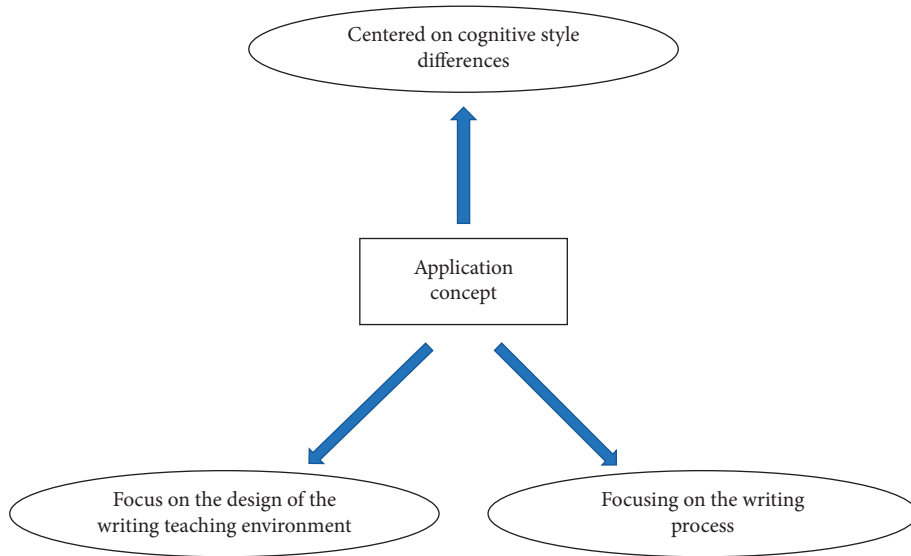


FIGURE 2: Whole teaching process following the application concept.

TABLE 1: System development environment.

Software category	Software name
Operating system	Windows 8
Development language	HTML6
Development tool	HBuilder
Database version	SQL Server 2018
Server version	Apache 4.31.18-rc-communit

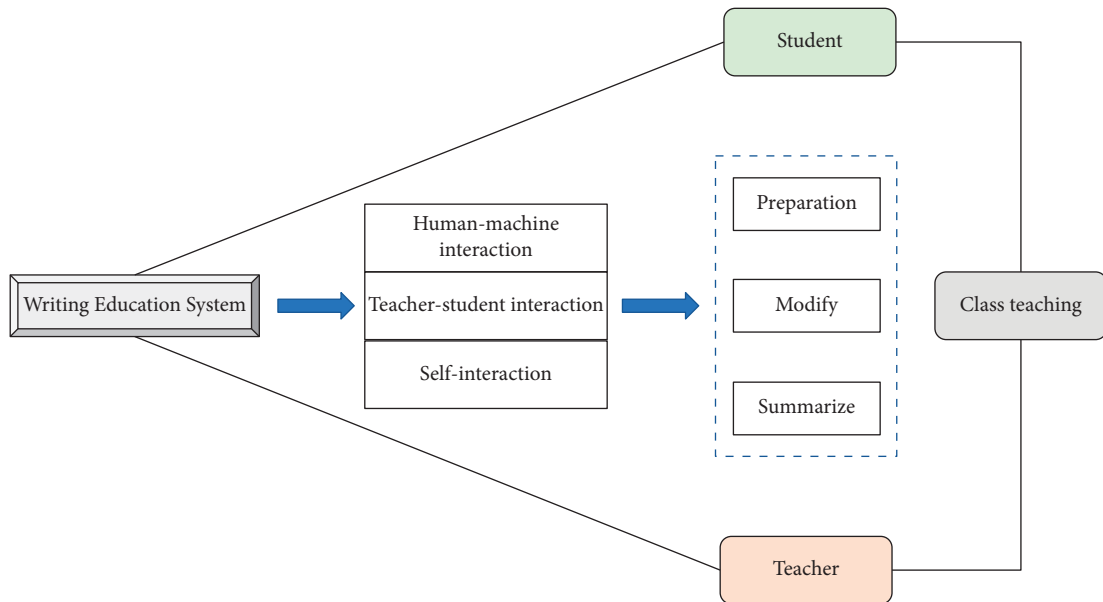


FIGURE 3: Process of the multicomponent writing instructional model.

month. Some users have a very uneven amount of learning. This is evidenced by a large number of ratings during a certain period of time and very few reviews during other periods of time. The presence or absence of comments and the distribution of learners' ratings over time can be seen as two different dimensions of user evaluation behavior.

Traditional user-based collaborative filtering algorithms cannot distinguish between users with different behaviors. Therefore, this study proposes an improved collaborative filtering algorithm to evaluate English writing instruction. To be specific, the framework of the improved collaborative filtering algorithm is displayed in Figure 5.

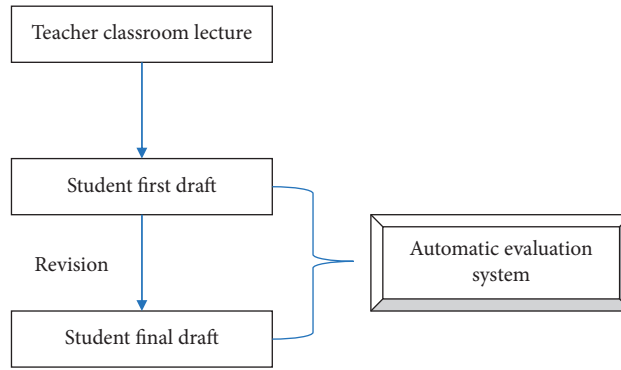


FIGURE 4: Process of teaching English writing.

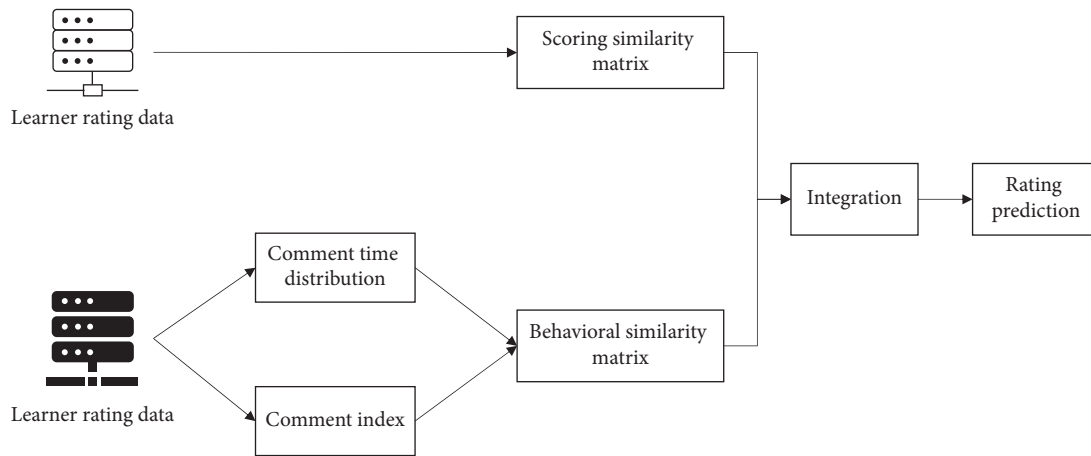


FIGURE 5: Framework of the improved collaborative filtering algorithm.

3.2. Learner Behavioral Similarity. The comment index can be adopted to quantify the commenting behavior of English learners. To be specific, it can be used to characterize learners' willingness to comment. In other words, the larger the index, the more likely the learner is to comment on the learning process after learning to write in English. Learners tend to show different evaluative behaviors after learning a part of the course. On the one hand, some learners simply rate it. On the other hand, some learners will write comments, analyzing the course in depth and expressing their own insights. Therefore, the different commenting behaviors distinguish different types of learners. Based on similar ratings, two learners are more likely to be similar if their behaviors are similar. As a result, the learner's review profile can be expressed as follows:

$$LC = [N_0, N_1], \quad (1)$$

where N_0 refers to the number of English courses without comments, and N_1 indicates the number of English courses with comments.

After that, the simplest formula for the comment index can be expressed as

$$CI = \frac{N_1}{N_0 + N_1}. \quad (2)$$

The above formula gives the same weight to each course when calculating the review index of learners. In fact, when it comes to reviewing English courses, some courses are very popular, so these courses are more likely to be reviewed. However, there are courses that are relatively uncommon. Similarly, some learners only review popular courses, while others review courses that are both classic and niche. Therefore, the review index calculated without considering the popularity of a course does not fully reflect the learners' willingness to review. Here, the popularity of an English writing course is defined as the number of times the course has been reviewed. Thus, the popularity of an English writing course can be defined as

$$H_i = \text{count}(C_i), \quad (3)$$

where C_i refers to the list of learners of the evaluated course.

For each learner, the distribution of the heat of their learning courses is also different. In this study, two learners with the same number of evaluated courses from the experimental set were selected and their hotness distribution charts are plotted in a histogram, as shown in Figure 6 and Figure 7.

3.3. Analysis of English Learner's Assessment. The following table shows the reviews of learners with similar review indices calculated using the formula. Table 2 provides an

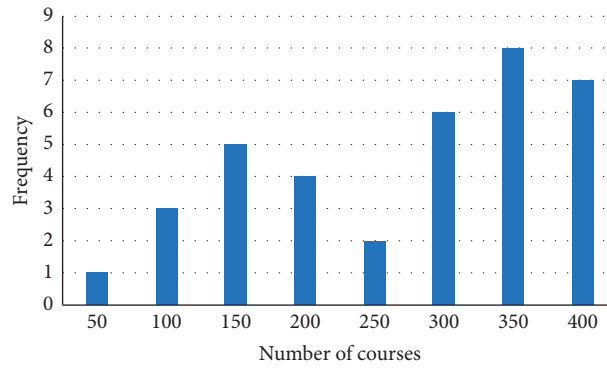


FIGURE 6: Hotness distribution chart of learner A.

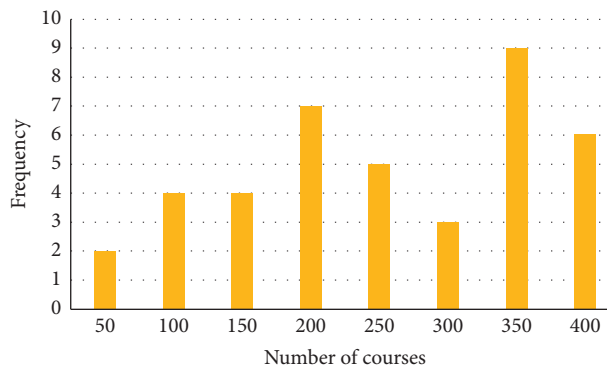


FIGURE 7: Hotness distribution chart of learner B.

TABLE 2: Comments from learners with an approximate comment index of 0.

Leaner’s ID	Number of no comments	Number of comments	Total number
875	6	0	6
846	8	0	8
891	14	0	14
878	75	2	77

TABLE 3: Comments from learners with an approximate comment index of 0.

Leaner’s ID	Number of no comments	Number of comments	Total number
742	1,879	637	2,516
786	34	382	416
713	759	463	1,222
799	448	1,083	1,531

approximate comment index of 0, while Table 3 provides an approximate comment index of 0.31. From these results, it can be seen that Table 2 has a low number of learners and a low proportion of learners commenting on the course. In Table 3, the number of learners taking the course is high and the percentage of comments is high. As a result, the learner review index can clearly distinguish between these two different types of English learners.

Therefore, according to the content and topics of college English writing, teachers should provide students with appropriate writing teaching support. College English writing mainly consists of narrative, descriptive, and argumentative essays. Students need to master the writing requirements

and common sentence expressions of these types of essays. In English writing, teachers explain these types of essays in detail in class and give students writing tasks for them.

4. Conclusion

This study found that the automatic evaluation system had a positive impact on college students’ English writing by applying it to their English writing instruction. To be specific, this system can improve students’ English writing. First of all, the automatic evaluation system can support the teaching of English writing in college and optimize the teaching process of English writing in college, thus

improving the English writing level of college students of different degrees. In addition, the use of an automatic evaluation system can change the traditional way of writing in class and the traditional way of teacher's correction. As a result, it can further improve the efficiency of teachers' classroom teaching. By using information technology, teachers can break the time and space limitation of writing teaching, and students can make full use of the time outside the classroom for writing training, which increases students' opportunities to write. The automatic evaluation system provides automated review and correction of students' writing problems. Students can continuously revise their drafts based on the review results to reduce problems in English writing. The human-computer feedback provides students with real-time, quick guidance. Teachers can provide practical writing assistance and guidance for students with different cognitive styles in classroom writing instruction and classroom writing guidance to meet the needs of students with different cognitive styles.

Although this study has achieved some research results, there are shortcomings due to capacity and time constraints. This study provides insufficient evidence of the effectiveness of the automated evaluation system in the improvement of college students' English writing skills. Although the data analysis at a later stage showed that the automated evaluation system improved the English writing performance of students with different cognitive styles in some ways, the study did not provide a thorough and comprehensive understanding of the college English curriculum. This has an impact on the results of the study, which lack breadth and depth. Therefore, the transferability of the study's findings needs to be further verified.

Data Availability

The labeled dataset used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest.

Acknowledgments

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