

Retraction

Retracted: Metacognitive Strategies in Undergraduate College Students' English Writing Based on Optimization Theory

Mathematical Problems in Engineering

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] T. Liang, "Metacognitive Strategies in Undergraduate College Students' English Writing Based on Optimization Theory," *Mathematical Problems in Engineering*, vol. 2022, Article ID 5978676, 11 pages, 2022.

Research Article

Metacognitive Strategies in Undergraduate College Students' English Writing Based on Optimization Theory

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In the existing research, scholars have different views on the concept and structure of metacognition. Based on different theories, they produce different training methods of metacognition strategies. However, because the training design and training process in the experiment are too complicated and the time is difficult to control, it remains difficult to effectively extend this kind of training to more educational fields. This paper deeply integrates the optimization theory with the case teaching of college students' English writing in undergraduate colleges and proposes the optimal design of the case teaching process. The optimal design is mainly carried out according to four processes: English writing education consultation, English writing teaching case compilation, English writing case teaching implementation, and English writing case teaching evaluation. In ordinary English writing, students focus on four aspects: preplanning, selective attention, self-monitoring, self-evaluation, and adjusting, controlling, and managing one's own cognitive activities according to self-monitoring metacognitive strategies, mastering the optimization theory, and adjusting the writing speed are self-adjustment and self-evaluation according to one's own situation. In the selected dimensions of English writing, the mean of the postwriting test was higher than that of the prewriting test. The mean of the "average sentence length" increased from 8.6 to 19.1. Integrating metacognitive strategy training into English writing teaching can improve students' English writing ability.

1. Introduction

In today's era, as the lingua franca of the world, English is becoming more important in social communication and has been widely valued by the society. In China's social, political, and economic development, there is an urgent need for talents who can communicate in English proficiently. This poses a new challenge to English teaching. English teaching needs to set new and higher teaching goals according to the needs of new forms to meet the needs of society. English writing teaching is a major part of college English teaching. As an important skill in English learning, English writing has been getting much attention; it is an effective way of English learning. Unfortunately, after many years of English learning, many students have low English writing ability and cannot write decent English compositions. Even at the university level and after taking writing courses, students' articles contain many semantic, discourse, pragmatic, grammatical, and lexical errors. Not only do they fail to meet the

requirements of the syllabus, but also they fail to communicate effectively in writing. Accordingly, improving students' English writing ability has become an urgent problem for English teachers. For most undergraduates, the concept of metacognitive strategies is still unfamiliar. Therefore, it is of special significance to conduct metacognitive strategy training in English writing classes to cultivate learners' lifelong learning ability through school education.

English writing practice can help expand one's vocabulary. The vocabulary used in English writing is much more than the vocabulary used in spoken language, and the language forms are various, which helps expand vocabulary. Aliyev and Ismayilova's study aimed to explore the effectiveness of combining film and English writing teaching with the support of network technology [1]. Ismail determined the multiple intelligence characteristics and significant intelligence model of preuniversity students in urban and rural areas [2]. Djedelbert Lao used several strategies in compiling and analyzing the data by applying descriptive qualitative

methods [3]. Rahman explored the benefits of blended learning in writing learning [4]. Elkot and Ali investigated factors influencing students' English writing skills and motivation [5]. However, the English writing teaching effect they proposed is not very good. This paper introduced the optimization theory to optimize it.

Optimizing theoretical teaching is the best solution in the process of a teaching organization. Hong et al. proposed a multiobjective transportation optimization model [6]. Wang et al. proposed the Beetle Swarm Optimization (BSO) algorithm [7]. Wang et al. proposed a performance metric that balances imaging speed and accuracy [8]. Klipkova et al. explored the structural model of personnel management [9]. Zhang et al. established a customized bus route optimization model [10]. Nevertheless, the optimization theory they proposed did not reflect the optimal design.

This paper studied the application of metacognitive strategies in college students' English writing teaching, combined with optimization theory, aimed to explore the joint learning and cultivation of metacognitive strategies by teachers and college students and explore the positive effects of metacognitive strategies on college students' English writing ability improvement. By integrating metacognitive strategy training into writing teaching, this experiment conducted a comparative study on the writing scores before and after the experimental class after using metacognitive strategies for teaching intervention in the experimental class. In this way, metacognitive strategy teaching can effectively help improve students' English writing performance. Writing is a comprehensive skill that can fully reflect students' language ability. English writing has become an important indicator to measure students' English mastery. Metacognitive strategies can closely link metacognitive knowledge and students' dynamic writing activities. By implementing English writing metacognitive strategy training, the present paper uses this theory to guide college students to master scientific English writing methods and writing skills and help them understand and adjust their English writing process. Therefore, the writing teaching integrated with the training of metacognitive strategies is helpful to the students' systematic writing learning. This kind of learning concept will also affect the students, which will have far-reaching significance for their future lifelong learning. This paper aims to provide useful suggestions for improving college students' English writing level, cultivating students' autonomous learning ability, and improving college English writing teaching. The study found that the mean change of the experimental class was greater than that of the control class, increasing from 126.2188 to 147.2188. In contrast, the mean change of the control class was smaller, increasing from 118.1538 to 121.8308. The monitoring strategy was 2.8396 (STD = 0.6211), and the evaluation strategy was 2.1996 (STD = 0.6822).

2. Metacognitive Strategies in Undergraduate English Writing

2.1. College English Writing. The English learning level of college students can be reflected in the English writing level. Among the five links of English teaching (listening, speaking,

reading, writing, and translation), college students' English writing is the most time-consuming and labor-intensive, in which students face difficulty achieving quick results because English writing training is neglected in college English teaching. Compared with listening, speaking, reading, and translation, most teachers spend much less time on English writing teaching. Most college students learn English for exams, not for application; memorizing English words, sentences, and grammar consumes most of their English learning energy and time. Therefore, English writing strategies are often overlooked. As English writing accounted for 20% of the comprehensive English assessment, how to improve the English writing ability of college students is an urgent issue that needs to be solved in English teaching.

First, the English scores at the time of school entry, the English scores at school, and the CET-6 scores were converted into the percentile system to enhance the contrast effect [11, 12]:

$$x_{ij} = \frac{x_i}{P_{ij}} \times 100. \quad (1)$$

In the previous formula, x_{ij} represents the result of the j -th English of the i -th student [13].

The mathematical expression of the information gain rate is as follows [14, 15]:

$$\text{InfoGainRatio}(A) = \frac{\text{InfoGain}(A)}{H(S_1, \dots, S_N)}. \quad (2)$$

Among them, $\text{InfoGainRatio}(A)$ is the information gain rate of the decision tree.

In classroom teaching, teachers explain to students the writing format of the article, the use of punctuation marks, the arrangement of paragraphs, and the layout of the chapter. There is very little time to practice writing, and students cannot get enough guidance and help when writing. Therefore, they have to turn to their mother tongue and get inspiration from its writing teaching. This traditional English writing teaching method has at least three drawbacks. First, it is separated from the specific writing context, and teachers explain the sentences, paragraphs, and chapters in the textbook, which have no direct connection with students' actual life. Such rigid teaching of writing knowledge is difficult to arouse students' interest. Secondly, teachers teach knowledge according to the requirements of the syllabus. Due to the distance between the teaching content and the actual needs of the students, their real needs are ignored. Therefore, the content of the lecture is not covered, and the content that the students already know is repeated. The English writing teaching framework is shown in Figure 1.

2.2. Metacognitive Strategies. The various influencing factors in the learning process are the knowledge level, that is, metacognitive knowledge. The scientific classification method can divide the factor knowledge into three kinds:

- (1) The main body of the learner is personal knowledge, including two aspects of cognitive differences between different individuals and cognitive influencing

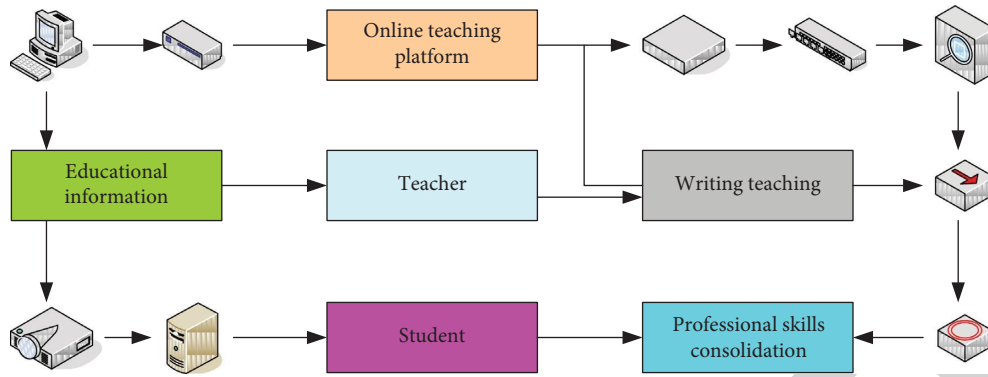


FIGURE 1: English writing teaching framework.

factors. Among them, the differences between cognitive individuals are mainly reflected in the basic situation of self-knowledge, such as one's own preferences, strengths, and weaknesses; the differences between individuals in cognition are also reflected in the different cognition methods of oneself and others; and the fundamental method of cognition of influencing factors is to obtain answers through scientific experiments.

- (2) Knowledge related to the learning objectives: for example, the learner must be consciously aware that the series of properties of the learning material will be the influencing factors of cognitive activity. The completion of learning tasks and objectives depends on the progress of learning methods.
- (3) Knowledge of learning strategies: this aspect includes much content. For example, in cognitive activities, it is necessary to know the cognitive strategies, the strategies included, and the conditions and situations they apply to, as well as their advantages and disadvantages in cognitive activities and different cognitive tasks and, in the face of cognitive strategies, how to make choices.

The error confidence interval for each node is calculated as follows [16]:

$$P[(f_i - e_i) < Z_{\alpha/2}] = 1 - \alpha. \tag{3}$$

$Z_{\alpha/2}$ is the critical value; then, the maximum value of the true error of the English writing score of the i -th node is as follows [17, 18]:

$$e_i = Z_{\alpha/2} \cdot \sqrt{\frac{f_i}{N_i}}. \tag{4}$$

Cognitive regulation is the exercise of self-control in problem-solving, that is, planning, monitoring, regulating, and evaluating one's own performance. This self-regulation process is primarily a technique that learners use in managing their learning. Cognitive conditioning processes include planning activities, monitoring activities, and examining results. The selection of appropriate strategies and the allocation of resources that affect efficiency are

planning activities. Monitoring activities refer to the monitoring, detection, modification, and rearrangement of learning strategies. Inspection results refer to the result evaluation of the use of strategies with reference to the criteria of efficiency and effectiveness. The cognitive model of students' writing process under cognitive strategy training is shown in Figure 2. The analysis of the experimental data mainly includes two aspects: first, evaluating the writing results of the subjects and second, recording the specific content of the subjects' thinking aloud, drawing their cognitive and metacognitive operation flowchart, and summarizing the strategy list and internal components in the process. Judging from the cognitive flowchart and strategy usage map, students who have been trained in metacognitive strategies have a more comprehensive understanding of writing activities. Its cognition can form a scientific and complete thinking process and use relevant learning strategies reasonably in each link. By recording and analyzing the students' thinking processes, the writing process under the influence of metacognitive strategies can be understood more intuitively. It is further demonstrated from the side that writing under the guidance of metacognitive strategies is more mature than before.

The experimental subjects selected in this paper are 70 students from the first and second classes of undergraduates. The average English score of the students in the two classes is about 75 points, which is an average level among the 20 teaching classes in the whole grade, and the male-to-female ratio is basically the same. The experiments were conducted with the informed consent of the research subjects. According to the above situation, the English writing levels of the students in the experimental and the regular classes are almost the same. The experimental class students were trained with metacognitive strategies in the teaching process, whereas the regular class adopted conventional teaching methods and means. Before, during, and at the end of the teaching experiment, three English listening tests and three follow-up questionnaires on the use of metacognitive strategies were conducted, and statistical analysis software was used to analyze the test and survey results.

In the process of metacognition, individuals need to apply certain knowledge to effectively complete the process.

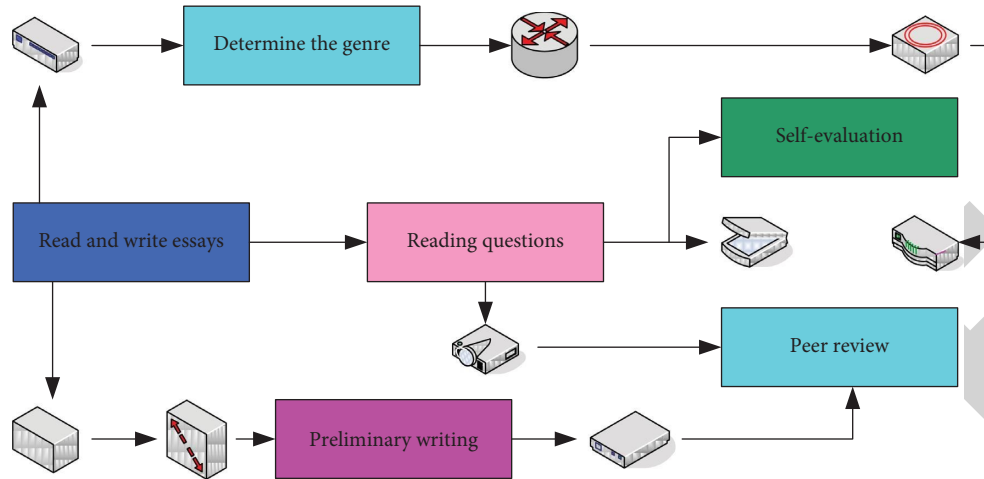


FIGURE 2: Cognitive model of students' writing process under cognitive strategy training.

The required knowledge comes from the result of higher-level processing, and only the knowledge accumulated by higher-level processing can regulate this cognitive process. Metacognitive strategies are teachable and learnable; teachers should not only impart knowledge, but also focus on developing students' metacognitive knowledge so that they can master metacognitive strategies. Students with metacognitive ability have strong learning initiative and autonomy and can better improve their learning strategies, thus forming a virtuous circle of learning. The English Metacognitive Strategies and the Metacognitive Strategies Questionnaires were used. The questionnaire has 27 questions, including planning, selective attention, monitoring, and self-evaluation strategies. All questions were scored using a 5-point scale.

For the metacognitive decision table, its discrimination function is as follows [19]:

$$p^* = \{m_{ij} * m_i\}. \quad (5)$$

The weight of English writing indicator r is defined as follows [20, 21]:

$$\tilde{\varepsilon}_r = \frac{\sigma}{\sum \sigma_r}. \quad (6)$$

In the previous formula, i is the English writing index element of the index set P [22].

2.2.1. Preexperiment Test. The teaching experiment was conducted in the first semester. The writing class offered by the experimental and control classes was 18 teaching weeks, 2 class hours per week. Before students were trained on metacognitive strategies, all students in the experimental and control classes were given a questionnaire survey on metacognitive strategies, a written self-assessment, and a writing test. The writing test paper adopted the composition of the CET-4 for English majors, requiring students to complete an argumentative essay of about 200 words within 30 min. In order to improve the reliability of the experimental results and control the irrelevant variables, another

teacher in the same group was asked to perform the marking work. In this test, 70 test papers were distributed and 70 were returned.

2.2.2. Postexperimental Test. At the end of the first semester, all students in the experimental and control classes were given metacognitive strategy questionnaires, written self-assessments, and CET-4 composition test papers. The data statistics and scoring methods were the same as those of the pretest.

At the beginning of the experiment, a questionnaire survey on metacognitive strategies was conducted among the students in the experimental class, and the students were asked to conduct a writing self-assessment. The advantage of this is that students are involved in the course from the beginning, making them aware of the course's requirements and the teacher's expectations for the students and the course. In contrast, it provides students with opportunities for self-awareness and self-reflection, which can guide them to comprehensively reflect on their original learning process and learning characteristics and help them understand the cognitive process of writing learning, understand their own problems, and think about improvement methods, aiming to promote students acquisition of metacognitive knowledge. At the same time, it enables teachers to have a general understanding of the use of students' metacognitive strategies and implement corresponding teaching strategies more pertinently in future training.

This step aims to stimulate students' metacognitive awareness and make students clear their learning tasks and make plans. Therefore, teachers have the responsibility to help students recognize their own strengths and weaknesses and formulate realistic learning goals. The goals established must be attainable, measurable, and consistent with other goals. Goals can be short- or long-term. Long-term goals refer to the goals of learning this course, which can help learners look forward to their own prospects for learning the language and the course from a long-term perspective and generate learning motivation. The short-term goals can be set as weekly goals. For example, some

students will ask themselves how many English words they master, how many English original articles they read, or how many English compositions they write every week. The clearer the goal, the more conducive it is for learners to measure their own situation. Through self-reflection and clear learning goals, students will consciously think about how to improve their writing skills and the reason for their unsuccessful writing, which lays a psychological foundation for stimulating students' metacognitive awareness. At the same time, it can introduce the metacognitive theory and strategies and their connection with second language acquisition for students to enhance students' metacognitive awareness.

In general, the membership functions of R rough sets in English writing are as follows [23, 24]:

$$\rho_X^R(x) = \frac{[x]_R \times X}{|[x]_R|}. \quad (7)$$

The D kernel of C is the set of English writing abilities of m_{ij} that resolves all individual elements in the matrix [25]:

$$\text{cored}(C) = \{\delta \in C | m_{ij} = \delta\}. \quad (8)$$

The specific steps of English writing metacognitive training in the classroom are as follows:

- (1) Preparation stage: in the writing class, the students' writing practice is linked, and the classmates are organized to discuss and review the metacognitive strategies that everyone has used in writing so that students have a preliminary understanding of the metacognitive strategies and their use. By analyzing the problems and functions of metacognitive strategies in students' writing, the role of metacognitive strategies is presented to students so that they can feel the importance of metacognitive strategies to stimulate students' learning motivation and mobilize their enthusiasm for learning and using metacognitive strategies in writing.
- (2) Presentation stage: students mainly carry out writing training through specific writing tasks. In the writing class, according to the conditions, ideas, and specific methods of the use of metacognitive strategies, the teacher adopts the method of "thinking aloud" to demonstrate the metacognitive writing strategies based on the optimization theory and actively understand the use of metacognitive strategies to improve writing convenience and meaning.
- (3) Practice phase: students will apply the metacognitive strategies learned in the first two stages and the specific ideas and methods of their application to specific writing tasks and adopt the optimization theory to their own thinking process to focus on writing in future writing. In the problem, choose the most appropriate strategy to solve the problem and improve the writing efficiency and quality. This can stimulate students' enthusiasm for writing and reduce their anxiety about writing tasks.

- (4) Summary stage: first, students can compare and evaluate the completion of this writing task and the previous writing task. Then, students use the optimization theory's English writing metacognitive strategies to understand themselves in depth.

2.3. Optimization Theory. To implement the optimization of English writing, students should do their best to consider their own characteristics but not blindly adapt to others, as required by those who advocate for the "free" educational theory. The optimal theory holds that the educational impact is based on the enthusiasm and possibility of students, and students' development must be brought to a new and higher level. In the optimization theory of English writing, students should optimally formulate study plans and write study designs according to the requirements of English writing. Students should make systematic arrangements for their plans or be aware of them, considering various learning styles. In this way, we can grasp the whole direction of English writing and successfully complete the English writing task. In addition to excellent learning design, a good class also requires students to have the ability to organize their learning reasonably, including classroom study, classroom listening, question answering, and learning methods. Making good use of classroom learning is a necessary teaching skill for students. The so-called "optimization" does not mean "the best" or "the most ideal" but refers to the best effect that can be achieved under specific conditions, that is, a class collective in its current teaching. Under these conditions, the maximum English writing effect can be obtained with the minimum investment of time and energy, which is the standard of "optimization." Based on the conditions of modern school learning, we take the quality and effect of completing the learning tasks in case learning and the energy and time students spend to complete the learning tasks as two criteria for evaluating the optimization of case learning. The evaluation of the effect of case students' English writing learning is based on their participation in the classroom, the quality of homework, the development of thinking, and the formation of their morality. If a model is constructed and the N th English word is the word to be predicted, it is called an N -gram model. Its expression is as follows:

$$P(W) = \prod_{i=1}^n P(W_{i-N+1}). \quad (9)$$

If the message length is n , the English word/character entropy (aka entropy rate) is defined as follows:

$$H = \frac{1}{N} (x_1, \dots, x_n). \quad (10)$$

In the learning activities, we should be good at putting forward clear learning goals for ourselves and recognize that each learning goal proposed can be divided into several small goals. Choosing the optimal study plan according to the optimal English writing theory requires the educational thinking of question exploration. With the recurrence

TABLE 1: Metacognitive strategy statistics.

Strategies	Mean	Standard deviation
Metacognitive strategies	2.6333	0.5134
Planning strategy	2.6228	0.8003
Monitoring strategy	2.8396	0.6310
Evaluation strategy	2.1996	0.6822

method (which can help students improve their memory and reproduce English words better), students simply imitate one solution from several solutions to the learning task. With an exploratory, creative mind, they will choose from several possible methods the one that best suits the situation. Of course, students get nervous before making a decision, and the less independent thinking is, the more nervous they are. After choosing a study plan, students often still have doubts because whether the choice can be realized or not depends largely on their attitude toward English writing. The flexibility of students' thinking is needed here, and they can change and adjust their own activities according to the progress of the English writing process.

3. Results of Metacognitive Strategies in English Writing

The average score of the metacognitive strategy was 2.6333 (STD = 0.5134), and the average scores of its subcategories were as follows: "planning strategy" 2.6228 (STD = 0.8003), monitoring strategy 2.8396 (STD = 0.6211), and evaluation strategy 2.1996 (STD = 0.6822). Among these three strategies, the "monitoring strategy" was slightly higher than the other two strategies. The statistics of metacognitive strategies are shown in Table 1.

Among the three categories, the use of "monitoring strategies" ranked highest, followed by "planning strategies" and "evaluation strategies." Furthermore, the use of "monitoring strategies" was more surprising than the other two strategies. The monitoring strategy mainly refers to focusing more on English handwriting, the correctness of English word spelling, and the coherence of sentences. Teachers tend to overemphasize these contents in English writing teaching, so it is understandable that students use more "monitoring strategies." "Assessment strategies" ranked the lowest. According to the interviews, students rarely self-evaluate their own composition after completing the composition, they believe that composition evaluation is only the responsibility of teachers, and they know little about the advantages of self-evaluation. In addition, the use of "planning strategies" was not very high. The results are not surprising because starting an English composition is one of the most difficult tasks in English writing. It was learned from the interview that students lack the accumulated knowledge of English writing, such as reciting good sentence patterns, setting short- or long-term English writing goals. In contrast, teachers think that writing is a relatively difficult task that consumes more time than reading and listening, so they are reluctant to waste too much time on it.

This paper proposes the English writing mode of optimization theory. It can be said that the metacognitive

strategies of undergraduate college students' English writing based on optimization theory are dominant in today's English writing. This learning method emphasizes the rational use of language knowledge and requires using correct grammar, vocabulary, and linking words in the text. It encourages students to imitate and create knowledge, emphasizes the importance of writing theory and language knowledge teaching, and focuses on cultivating students' comprehensive ability. Better than the traditional result-based teaching method, students can learn English writing independently to take the initiative in the writing process. The results teaching method has diversity in the practical application according to the actual situation, but in general, it is always a process of teacher-led and students' passive learning. Most of the links are completed under the students' autonomous ability, and they can effectively write and evaluate their own writing. The completed essay is the only credential for assessing learning outcomes. Using metacognitive strategies to optimize English writing design can achieve the goal of cultivating students' practical language application ability through subtle influence and can truly achieve the purpose of quality education in English teaching. Under the guidance of the teaching optimization theory, this paper explores a new classroom English writing mode that uses the metacognitive strategies of the optimization theory through the process of situation creation and appropriate adjustment, with the learner as the main body, to better realize the optimization of college English writing quality.

Metacognitive strategy training has a great impetus for English writing teaching. Nearly 65% of students can quickly adapt to the teaching form of metacognitive strategies in English writing. Multimedia has entered the classroom and is presented to students in a brand-new teaching mode. Students welcome this new form of expression because visualizing metacognitive strategies in English writing enables students to quickly accept this teaching mode. Figure 3 shows the adaptation of the teaching form of metacognitive strategies in English writing.

Teaching optimization theory refers to a kind of research theory in which, in order to ensure the quality of teaching and improve the teaching effect, the appropriate teaching content is selected by rationally formulating teaching plans and scientific teaching methods are selected to achieve the best teaching effect, way, and strategy. The standard to measure the optimization of English writing classroom teaching in colleges should be less consumption, short time, and high efficiency. In other words, in classroom teaching, students can achieve the greatest effect in listening, speaking, reading, writing, and translation, among others, and the students' comprehensive English application abilities can be improved to the greatest extent. The appropriate English teaching method can be selected according to the optimized standard. In other words, the selected plan is the best from a certain standard.

This paper focuses on the optimization of classroom teaching of English writing in colleges and discusses the optimization of multiple aspects of classroom teaching of English writing in the context of modern metacognitive strategies. Therefore, it has certain academic and application

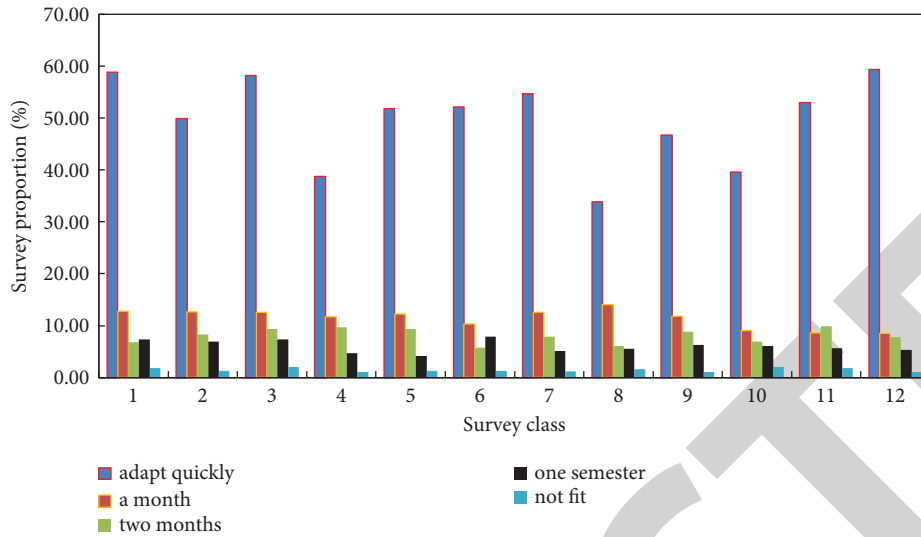


FIGURE 3: Adaptation of metacognitive strategies in English writing.

TABLE 2: Statistical analysis of English writing anxiety.

Strategies	Mean	Standard deviation
Metacognitive strategies	3.1002	0.6311
Planning strategy	3.1621	0.7256
Monitoring strategy	3.2102	0.6217
Evaluation strategy	3.0631	0.8499

values. The optimization of the teaching process is based on the specific teaching situation, such as teachers’ teaching and students’ ability to accept, to select a specific teaching plan from many teaching plans and apply it to the teaching practice to achieve the best teaching effect.

The average score for English writing anxiety was 3.1002 (STD = 0.6311). Among its subcategories, the average score for cognitive anxiety was 3.1621 (STD = 0.7256), the average score for avoidance behavior was 3.2102 (STD = 0.6217), and the average score for physical anxiety was 3.0631 (STD = 0.8499). Among them, avoidance behavior was higher than the other two subcategories. The statistical analysis of English writing anxiety is shown in Table 2.

Based on the science of education, psychology, and other disciplines, this paper draws on the theory of optimizing the English writing process of college students in undergraduate colleges and adopts research methods such as literature review, case analysis, and questionnaires to explore how college students in undergraduate colleges can reasonably use metacognition. This paper systematically studies the problem of strategies for English writing learning and, on this basis, puts forward new ideas and views on the use of metacognitive strategies in English writing to achieve optimal strategies for English writing classroom learning. Based on expounding the characteristics of metacognitive strategies and the idea of classroom learning optimization, this paper discusses the optimization problems of English writing thought, English writing method, English writing, and English writing design under the environment of modern metacognitive strategies. It should be emphasized

here that, due to the profound influence of traditional feudal thought in China, there are bound to be various resistances and difficulties in the understanding and application of modern metacognitive strategies. This is mainly not only from economic and technological constraints but, more importantly, from social and human ideologies. The optimization theory in English writing is a unity of inheritance and innovation, which is easy for students to accept. Metacognitive strategy learning in English writing has become an important part of modern educational technology with its unique advantages. Knowledge strategy learning has changed the form of college classrooms and promoted the update of educational methods and technologies. It is also an important means to promote the final optimization of students’ English writing methods. In order to realize the modernization of education, quality education, and optimization of the effect of English writing in the classroom, the schools, teachers, students, and even the whole education system and ideology must undergo fundamental changes. In this paper, some problems in the specific explanation and discussion still need further research and discussion and strive to further realize the optimization of college English writing methods under the environment of metacognitive strategies and optimization theory.

The correlation coefficient between metacognitive strategies and English writing anxiety was -0.305 ($P < 0.05$), indicating that the correlation coefficient between metacognitive strategies and English writing anxiety was slightly negative. In other words, if learners tend to use more writing metacognitive strategies effectively, their English writing anxiety level will be relatively lower. The correlation coefficient between metacognitive strategies and English writing anxiety is shown in Figure 4.

The effectiveness of teaching means that after a certain period of teaching, students reach a certain level in body, knowledge, function, and development. Effective teaching is the teaching that fully uses teaching rules, successfully guides students to learn, and achieves the predetermined effect of

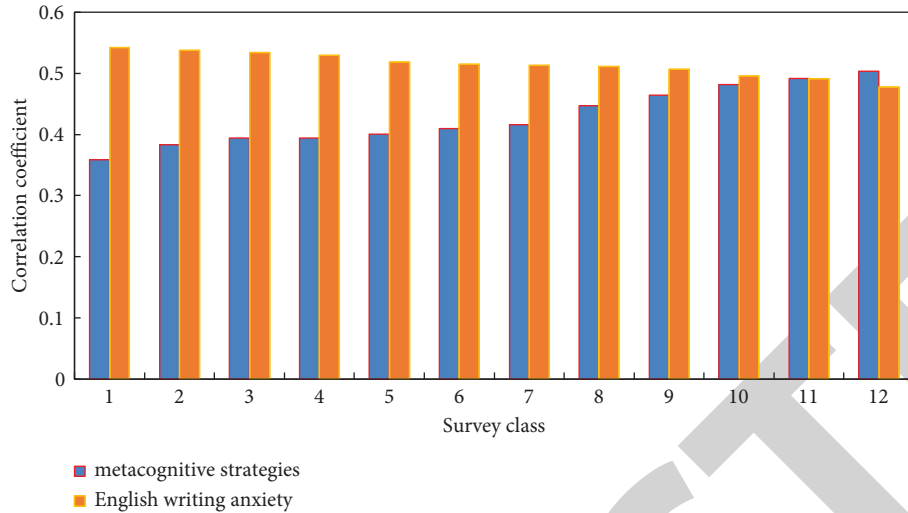


FIGURE 4: Correlation coefficient between metacognitive strategies and English writing anxiety.

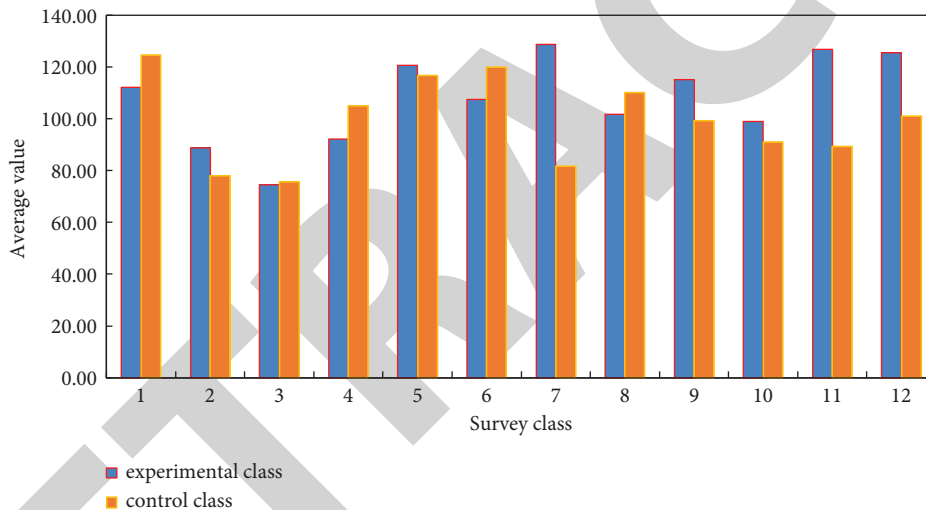


FIGURE 5: Statistics of metacognitive strategies pretesting.

English writing teaching. The statistics of metacognitive strategy pretesting are shown in Figure 5. In the comparison of subjects in the test and compared classes, the mean value of metacognitive strategies in the test class was 135.2188, and the mean value of metacognitive strategies in the control class was 132.1538. Their average difference was 3.06. The 95% confidence interval for the difference included 0, and the P -value was 0.158 in a two-tailed significant difference, which was higher than 0.05.

After collecting the initial data of the questionnaire, they were analyzed by SPSS24.0. The statistics of the English writing anxiety pretest in the experimental and control groups are shown in Figure 6. The average value of English writing anxiety was 70.5938 in the test group and 67.8923 in the compared group. However, according to the pretest of English writing anxiety in the compared and test groups according to the independent sample t -test, the P -value of the two-tailed significant difference was 0.27 ($P > 0.05$), which means that the level of English writing anxiety was not

significantly different. In addition, according to the pretest statistics of metacognitive strategies written in the compared and test groups, the average usage of metacognitive strategies was 126.2188 in the test group and 123.1538 in the compared group. However, the pretests of metacognitive strategies were written in the compared and test groups according to the independent samples t -test, and the P -value was 0.158 in a two-tailed significant difference, which was higher than 0.05. Therefore, there were no significant differences between the test and compared groups before metacognitive strategy training.

After 16 weeks of metacognitive strategies' writing training in the experimental group and 16 weeks of regular English writing teaching methods in the control group, the two groups of students were surveyed again on metacognitive strategies. SPSS24.0 statistical analysis was carried out on the data collected in the questionnaire to understand whether the use of metacognitive strategies of the two groups of students has been promoted in different English writing

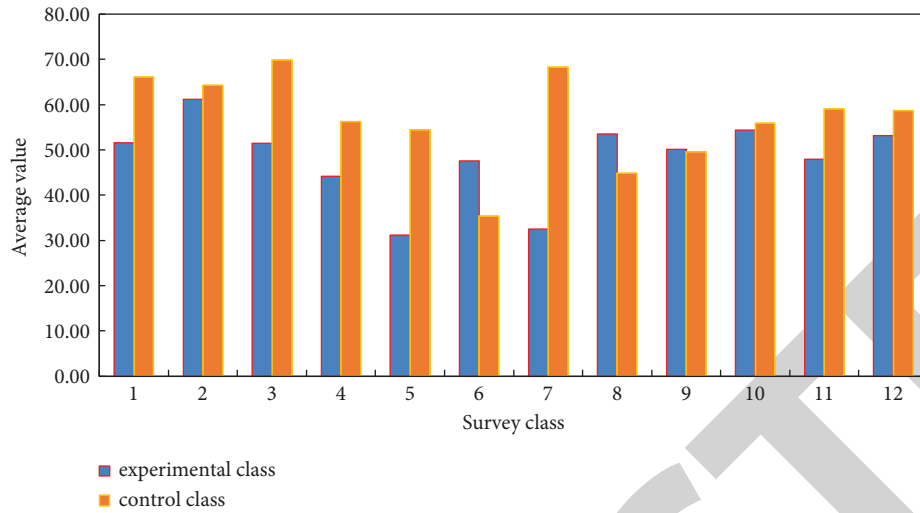


FIGURE 6: Statistics of English writing anxiety pretest in experimental and control groups.

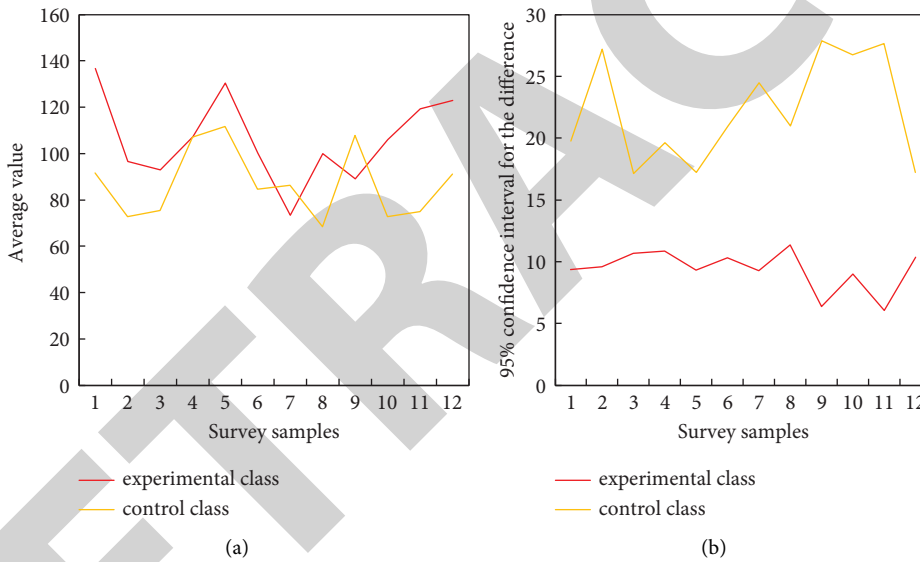


FIGURE 7: (a) Comparison of means. (b) 95% confidence intervals for the difference.

teaching experiences and which group has been promoted more. The mean values of the two groups of metacognitive strategies have a certain change. The mean change of the experimental class was greater than that of the control class, increasing from 126.2188 to 147.2188, and the mean of the control class increased from 118.1538 to 121.8308. In the paired sample *t*-test of the pretest and posttest of writing cognitive strategies in the experimental class, the sig (2-tailed) was 0.000 ($P < 0.05$). It showed a significant difference between the pretest and posttest of the writing metacognitive strategies of the experimental class (the comparison of means is shown in Figure 7(a)). The upper and lower 95% confidence intervals of the difference were 12.6829 and 29.3171, respectively, and there was no 0-cross (the upper and lower 95% confidence intervals of the difference are shown in Figure 7(b)). In the paired sample *t*-test of the pretest and posttest of writing cognitive strategies in the

control class, the sig (2-tailed) was 0.320 ($P > 0.05$). The upper and lower 95% confidence intervals of the difference were -3.6452 and 10.9990 , respectively, within the 0-cross range. In other words, regular English writing teaching did not affect improving the use of writing metacognitive strategies.

There are two basic standards for optimizing the English writing teaching process: the effect and time standards. The effect standard mainly measures the improvement effect of students in three aspects (education, education, and development) and evaluates the quality of the completion of English writing teaching tasks and the provisions of personnel training results. The time standard refers to improving the efficiency of English writing teaching and reducing the time consumed by various means in the process of completing the same educational purpose or English writing teaching task, which is mainly measured from the

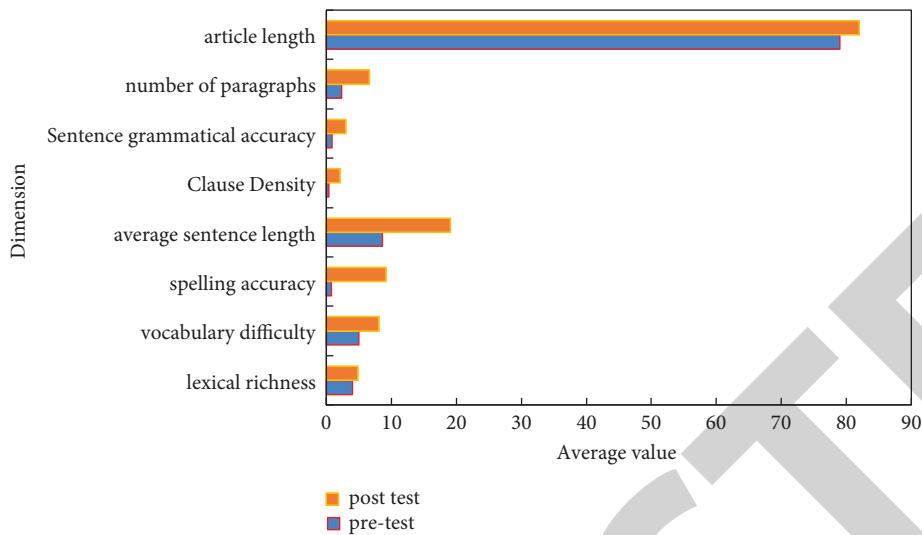


FIGURE 8: Mean comparison of English writing posttest and pretest.

student's learning load. The formulation of the two evaluation standards considers the quality of English writing teaching, but it does not increase the burden of students' learning. The evaluation of the English writing teaching process is to see whether the students have achieved the greatest possible effect of education and development in as little time as possible.

The mean comparison between the English writing posttest and pretest is shown in Figure 8. After the experiment, the students' writing organization, monitoring, adjustment, and evaluation abilities were enhanced. Students can use writing vocabulary more accurately and proficiently, and they develop richer, more advanced expressions in their writing. The logic of the composition structure is more reasonable, and students can effectively use subject headings, transition sentences, and linking words in the composition. In all selected dimensions, the mean of the postwriting test was higher than the pretest. Especially in the dimensions of "vocabulary richness," "average sentence length," "clause density," and "article length," students made great progress. The mean "vocabulary richness" of the Action Class students' writing test increased from 4 to 4.9. The mean value of the "average sentence length" increased from 8.6 to 19.1; the clause density increased from 0.4 to 2.1; and the mean value of "article length" increased from 79 to 82.

4. Conclusion

English writing practice can promote and improve students' English listening, speaking, reading, translation, and other aspects. When students practice writing, they have a personal experience of vocabulary and writing skills, among others, which can be smooth when translating. They can more accurately understand and learn the skills of others when reading. In the same way, due to the improvement of language ability, listening and speaking will also be improved. To help improve writing skills, students should apply metacognitive strategies to their writing learning. The main purpose of this

paper is to demonstrate that the introduction of metacognitive strategy training with metacognition and optimization theory as the main framework in English writing class can effectively improve learners' metacognitive awareness and cultivate and enhance English learners' writing ability. This paper applied the optimization theory to English writing teaching, investigated students' English writing through questionnaires and interviews, organized data, read many literature materials, explored the best combination of the two, and integrated metacognition. Strategies are incorporated into it in an effort to optimize English writing. The results showed that combining metacognitive strategy training with English writing teaching can effectively improve learners' English writing level and metacognitive strategy awareness. However, through interviews with students, it was also found that it is difficult to cultivate students' writing metacognitive strategies in a short period of time, which requires the joint efforts of both teachers and students.

Data Availability

The data used to support the findings of this study are available from the author upon request.

Conflicts of Interest

The author declares no conflicts of interest.

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