Engineering majors' metacognitive strategy use in EFL writing: a case study within the Web-based environments

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ABSTRACT: The present research sampled 57 engineering majors to investigate their use of metacognitive strategy and three sub-strategies in Web-based EFL writing. A contrastive and comparative analysis was further made to explore the differences and shared weaknesses in metacognitive strategy and three sub-strategies between groups of lower and higher writing proficiency. The findings indicated that students' holistic metacognitive strategy use was at the intermediate level, with planning strategy best, self-assessing strategy worst and self-monitoring strategy in between. Weaknesses for the lower group included goal setting, writing arrangement, awareness of self-correction and the adoption of Web-based technologies, while shared weaknesses consisted of sentence structures and material collection in planning strategy, behaviour self-monitoring, theme-relevance examination and goal keeping in self-monitoring strategy, and content and means of self-reflection in self-assessing strategy. Hence, pedagogic suggestions are proposed to improve students' effective metacognitive strategy use.

INTRODUCTION

The development of English as a foreign language (EFL) writing competence is an essential factor for college students to promote their academic and professional prospects, for it guarantees that the production of knowledge within specific disciplines can be communicated and disseminated in an international circle [1][2]. For engineering undergraduates, high proficiency in EFL writing helps smooth intercultural communication and cooperation, thus becoming a critical element to be qualified engineers in current Chinese engineering education programmes [3]. Unfortunately, EFL writing has always been the weakest aspect of college English teaching in China [4-6], correspondingly students' writing skills being the most embarrassing among the five skills of English [3][6]. Compared with English majors, non-English majors are deficient in systematic EFL writing instruction and training [4][5][7], with engineering students being no exception. Naturally, how to facilitate their writing skills falls into the focus of both researchers and educators.

EFL writing, from a cognitive perspective, is viewed as a complex recursive process, which encompasses the interactive stages of planning, outlining, generating and revising [6][8], and is inseparable from students' conscious control of planning, monitoring, assessing and self-regulating activities [9]. Therefore, metacognition, as the high-level cognitive process, becomes a crucial factor to affect the writing outcomes. The cultivation and promotion of engineering students' metacognition can be achieved by intervention and instruction on metacognitive strategies in teaching procedures [9-11].

The wide application of Web-based learning technologies is changing EFL writing patterns for college students: they have become the centre of writing activities in after-class settings; at different stages of writing, they can have easy access to knowledge, resources and assistance via the Internet, multimedia and different forms of digital instruments. In the meantime; however, the diverse Web-based environments pose great challenges to on-line EFL writing, a component of self-regulated English learning, for students may get lost in, or over-rely on, the abundant information within [12][13]. Undoubtedly, how college students in Web-based environments can make wise selections on information, monitor writing process, assess writing products and regulate their own writing behaviour, are issues worthy of academic and pedagogic attention [7][12][14].

In fact, the existing literature has shown that both EFL learners' metacognitive strategies and their learning environment can shape EFL learning outcome [7][15-17]. Over the past few decades, numerous studies have been implemented on the relationship between metacognitive strategies and EFL learners' learning performance, with positive conclusions [7][18-21]. Comparatively, the number of studies on how metacognitive strategies influence a specific language skill is limited, with fewer studies on the role of metacognitive strategies in EFL learners' writing competence [1][4][6][7][17][22], especially, when there is consideration of the characteristics of EFL writing by means of Web-based learning technologies [7][23]. In the context of China, the study into engineering majors' metacognitive

strategy use within Web-based environments helps offer targeted suggestions on facilitating their writing competence with effective metacognitive strategy use, thus, becoming the key to deepening engineering education programmes.

On the basis of the analysis above, the aim of this article is to investigate distribution features of metacognitive strategy use and three-sub-category use by engineering majors in Web-based EFL writing. A contrastive and comparative analysis was made to explore the differences of, and shared weaknesses in, metacognitive strategy use between the groups of higher and lower writing proficiency. It is anticipated that the findings will offer pedagogic suggestions about the intervention, instruction and training to raise engineering majors' metacognitive skills and awareness, promote their writing competence and build up their capacity of self-regulated learning in EFL learning.

METHODOLOGY

Research Subjects

The participants in the research were 61 engineering freshmen from Southwest Forestry University of China, all from one class with mixed majors of environmental engineering, and electronics and information engineering. The subjects were made up of 34 females and 27 males, 44 from Yunnan Province, where the University is located and 17 from other parts of the country. Local students with lower-intermediate English proficiency are the majority of engineering students in the University.

Research Instruments

Instruments in the research included a questionnaire, an argumentative essay on the Pigai Network and a semi-structured interview. The questionnaire consisted of three sections: the first section was to collect private information on the participants, including name, gender, major, birthplace and college English scores in the first semester. The second section was a tertiary student-writers' metacognitive strategy use scale designed by Qin and Zhang with established validity and reliability [7]. The scale comprised 22 items, three factors identified by exploratory factor analysis: planning strategy (items 1-7), self-monitoring strategy (items 8-18) and self-assessing strategy (items 19-22).

All the items used a 6-point Likert-like scale with 1 (strongly disagree), 2 (disagree), 3 (somewhat disagree), 4 (partially agree), 5 (agree) and 6 (strongly agree). The 6-point rating scale was designed to avoid distorted data from participants with ambiguous response of *neither agree nor disagree* [7]. The third section was open-ended questions concerning individual difficulties in Web-based EFL writing and the countermeasures, use of on-line sources, participants' perception towards, and general writing process on the Pigai Network.

The research sampled a composition titled *Are we more connected or more alone*, an argumentative essay of a national composition contest on the Pigai Network in May 2017. It was a material-based writing piece of at least 200 words, available from 16 to 28 May 2017 when all the subjects were in the second semester of freshman year. As veteran EFL writers on the Pigai Network, all the participants were required to participate and were encouraged to make full use of on-line resources and revise their articles, before the time was due. Semi-structural interviews were used to clarify and interpret data from questionnaires, 14 interviewees selected at random, seven from either group.

Data Collection and Analysis

The questionnaire data collection took place in June 2017 during a regular college English class, where the English teacher was responsible for administering and retrieving all the questionnaires. All the participants were informed of the purpose of the questionnaires and asked to choose the appropriate number below each statement honestly and to write down what was true for them to each question. It took 25 minutes to complete the questionnaire. Data from the questionnaires were examined manually, with 57 valid responses in total, and accordingly, 57 essays on the topic collected from the Pigai Network. All the data were handled in Word and Excel processors before being treated with SPSS 18.0. The three-type usage levels proposed by Oxford and Burry-Stock [24] were adopted in reference to defining the levels of participants' metacognitive strategy use in Web-based EFL writing: high (mean of 4.2 or higher), medium (mean of 3-4.1) and low (2.9 or lower).

RESULTS AND DISCUSSION

The Pigai Network is an automated evaluation system built upon large corpora and theories, which prevails in Chinese universities and colleges, because of its credible reliability and effectiveness on suggestions and comments [25-26]. EFL writing assignments are a regular component of self-regulated EFL learning for engineering majors, five essays each semester. Each essay is required to be posted on-line within the two-week duration during which students are allowed to make unlimited modifications to their essays with rich on-line resources.

Feedback from peers and teacher afterward were also implemented via the Pigai Network from time to time. Every modification is recorded automatically, with every version subjected to the plagiarism detection on the Pigai Network. As a result, Web-based environments gain a growing impact on the EFL writing process for engineering

majors. According to the data, for instance, 88.3% writing difficulties were dependent on using e-resources for finding the solution. Under such circumstances, the investigation into engineering majors' metacognitive strategy use becomes essential and timely to sustain and guide pedagogic practices on corresponding intervention and instruction in increasing students' effective metacognitive strategy use.

Engineering Majors' Holistic Metacognitive Strategy Use and Three Sub-strategies

The distribution features of engineering students' holistic use of metacognitive strategy and three sub-strategies in Web-based EFL writing are displayed in Table 1. The descriptive statistics show that the holistic metacognitive strategy (3.900) was at the medium level, corroborating the conclusions of previous studies [4][7], indicating the necessity to instruct students on metacognitive strategy use in their on-line EFL writing. In terms of specific strategies, planning strategy (4.130) ranks top, higher than the holistic use of metacognitive strategy and close to high frequency use. Self-monitoring strategy (3.828) ranks second and self-assessing strategy (3.789) comes last, both lower than the overall metacognitive strategy.

Table 1: Descriptive statistics of holistic metacognitive strategy use and three sub-strategies.

Variable	Metacognitive strategy	Planning strategy	Self-monitoring strategy	Self-assessing strategy
Mean	3.900	4.130	3.828	3.789
SD	0.6191	0.6362	0.5133	0.7630

According to O'Malley and Chamot, planning and having a goal are crucial for learning success by providing guidance and urging preparations ahead of time [27]. According to the teaching requirements of college English in the university, 40% of the final grade comes from self-regulated EFL learning after class, with specific timelines set for various on-line tasks. Deviation from the rules definitely takes a toll on the final result. To some extent, all contribute to effective time management of engineering majors' English learning, writing on the Pigai Network included. When it comes to EFL writing, the writing performance is a more important measure index to calculate the final grade of self-regulated EFL learning. Over time, the majority have developed the habit of making writing plans and goals. Based on the data, all the participants confirmed that outlines always come before writing, propelling the overall planning strategy to approach high frequency use.

The reported writing difficulties concentrated on vocabulary, collocation, grammar, sentence patterns and relevance to the topic, all falling into the category of self-monitoring strategy, which depressed its holistic use level. Self-assessing was at the bottom, which was verified by data from the contest essay: the average of the essay modifications was 14, and 39 participants out of 57 failed to keep up with it. The lack of effective use of self-monitoring and self-assessing strategies, and using planning strategy alone failed to help engineering students to discern essay problems, take corresponding measures, summarise lessons and regulate individual writing behaviour in Web-based environments.

A Contrastive Analysis of Engineering Majors' Holistic Metacognitive Strategy between Groups of Higher and Lower Writing Proficiency

A contrastive analysis was aimed at detecting differences in the use of metacognitive strategy and three sub-strategies between groups of higher and lower writing proficiency, so that there can be intervention and instruction concerning the weak strategies. In this way, engineering majors' metacognitive strategy use can be improved and their writing competence increased.

The research, using the scores of the contest essay as a reference, selected the 25% best and worst participants as two independent groups, 14 students in either group. An independent sample test was run to examine the significance of differentiation in the writing proficiency of the two groups, with the two-tailed significance value being 0.000. Hence, the discrimination degree of the two groups arrived at the high level and was suitable for a contrastive analysis between two groups.

Table 2: Descriptive statistics of holistic metacognitive strategy and three sub-strategies between two groups.

Variable	Group of lower writing proficiency		Group of higher writing proficiency	
	Mean	SD	Mean	SD
Metacognitive strategy	3.854	0.5256	4.129	0.4888
Planning strategy	4.020	0.6603	4.255	0.6751
Self-monitoring strategy	3.812	0.4750	4.058	0.5199
Self-assessing strategy	3.679	0.7623	4.089	0.7044

The use of metacognitive strategy and three sub-strategies between the two groups can be seen from Table 2. Overall, the higher writing proficiency group performed better than the lower writing proficiency group in the use of metacognitive strategy (4.129/3.854) and three sub-strategies: planning (4.255/4.020), self-monitoring (4.058/3.812)

and self-assessing (4. 089/3.679). For the higher group, only planning strategy (4.255) reached the high frequency use, while the holistic metacognitive strategy (4.129), self-monitoring strategies (4.058) and self-assessing strategy (4.089) were downgraded to the intermediate level. For the lower group, all remained at the intermediate level. Planning strategy (4.020) was higher than holistic metacognitive strategy (3.854), self-monitoring strategy (3.812) and self-assessing strategy (3.679).

The distribution features of metacognitive strategy and three sub-strategies in the lower group were in line with those as a whole, while the performance by the higher group differed from that as a whole in the position of self-assessing and self-monitoring. Holistic metacognitive strategy use by higher group came close to the high level, displaying that they were more conscious of the EFL writing process in Web-based environments, better able to control the four stages, to spot problems within and to regulate their writing behaviour. With the relatively high level of metacogntition, they produced essays of higher quality. According to the data, the average score in the contest essay for students of higher writing proficiency was 89, close to excellence in EFL writing rating. Meanwhile, self-assessing strategy (3.679) in the lower group was at the bottom in all comparative items in both group comparisons and overall ranking.

In order to explore the specific differences and shared weaknesses in Web-based EFL writing between lower and higher writing proficiency groups, the research implemented a comparative and contrastive analysis of all items of metacognitive strategy in three dimensions.

An Analysis of Planning Strategy between Two Groups

From Table 3, it can be seen that the higher group reached high frequency use in making outlines (4.86), planning the central ideas (5.36), setting goals (4.43) and using modern technologies for knowledge reserve (4.50). Similar results were found in the lower group, except for setting goals (4.00), which relegates to the intermediate frequency use. In both groups, planning the central ideas (5.36/4.79) was the most frequently-used strategy, which was substantiated by data from the analysis of their writing process: outlining main ideas was the necessary step listed by all the participants. All the participants have been studying English for at least seven years, planning central ideas has been a habit in EFL writing: it can offer guidance on the collection of relevant materials from textbooks, Web sites or their own prior knowledge, thus easing writing and improving efficiency; it can also guarantee the written contents do not diverge from the topic during writing.

Table 3: Descriptive statistics of planning strategy use between two groups.

Items on planning strategy use	Lower group		Higher group	
	Mean	SD	Mean	SD
Before I write an EFL essay on the Pigai Network				
1. I outline the essay in advance.	4.36	1.008	4.86	0.864
2. I plan sentence structures of the essay in advance.	3.93	1.141	4.00	1.359
3. I plan all the central ideas in advance.	4.79	0.975	5.36	0.745
4. I set the writing goals and know what to do before logging onto the Pigai Network.	4.00	1.177	4.43	0.938
5. I plan how to use the writing materials to avoid losing myself in the information sea on-line.	3.29	1.069	3.21	0.893
6. I get myself ready by collecting materials relevant to the topic on-line.	3.36	1.277	3.43	0.646
7. I take the initiative to use modern networks for knowledge reserve, regardless of whether there is a writing topic.	4.43	0.938	4.50	1.019

The difference in setting goals between the lower (4.00) and higher group (4.43) should set off an alarm among English teachers, for it was one specific difficulty listed in on-line EFL writing. The follow-up interviews showed that engineering students with higher writing proficiency tended to regard Web-based EFL writing assignments as a means of achieving the goal of English learning and that they consciously apply the daily accumulation into writing: new expressions or collocations, complex or classic sentence structures, writing strategies, etc. The real-time scoring system on the Pigai Network was used selectively to examine what was achieved and failed. Comparatively, peers of lower writing proficiency inclined to take writing assignments as the goal and punctual posts were their single purpose. For them, EFL writing was just another independent language skill, seldom considered as an efficient way to evaluate the newly-acquired English learning. In fact, current studies have stated clearly that writing is a comprehensive skill, inseparable from other skills of English learning [1][4][12][22][24].

The performance of the lower and higher groups in sentence structure planning (3.93/4.00), material use planning (3.29/3.21) and material collection planning (3.36/3.43) arrived at the intermediate level. Interestingly, material use planning (3.29/3.21), the least-used strategy in both groups, was performed worse by the higher group than the lower group, which was against the rest of results in planning strategy. According to the interviewees from the higher group,

the writing materials were not always newly found on-line. Instead, they could draw on daily accumulations, therefore, standing less chance of planning how to use the immediately collected materials before writing. The writing contents were from their knowledge reserve, which was illustrated from their performance in using modern technologies for knowledge reserve (4.50). Common weaknesses in both groups on sentence structures planning and material collection had a negative impact on their writings, full of simple sentences and lack of persuasive demonstrations.

An Analysis of Self-monitoring Strategy between Two Groups

From Table 4, it can be found that the higher group performed well in writing arrangement (4.36), knowledge application (5.07), awareness of self-corrections (4.29) and emotion regulation (4.57), for strategy use of these items reached the high frequency use. Some of the findings fit the lower group, whose high frequency use were lower in knowledge application (4.64) and emotion regulation (4.36), while results for writing arrangement (3.71) and awareness of self-corrections (3.71) were less desirable. The difference was attributed to the lower group's perceptions towards writing assignments, passively taken as linguistic tasks from the teacher, not as a positive means to practice and enhance the newly-acquired in EFL learning.

Table 4: Descriptive statistics of self-monitoring strategy use between two groups.

Items on self-monitoring strategy use	Lower group		Higher group	
	Mean	SD	Mean	SD
When I write an EFL essay on the Pigai Network				
8. I arrange my writing schedule properly based on screen prompts.	3.71	0.825	4.36	1.082
9. I turn to on-line dictionaries to overcome vocabulary problems.	4.00	1.038	4.14	0.949
10. I apply all my knowledge into essay writing.	4.64	1.082	5.07	0.616
11. I self-monitor my writing behaviour and direct all attention to the writing task consciously, avoiding distractions from unrelated on-line information.	2.71	1.069	3.21	1.051
12. I examine whether my writing focuses on the topic all the time.	3.50	1.019	3.64	1.008
13. I remind myself continuously of finishing my writing goals before clicking other contents.	3.50	0.855	3.71	0.914
14. I remind myself of revisions by markings with the aid of software.	3.71	1.204	4.29	0.994
15. I control and regulate my negative emotions during EFL writing to avoid aimless on-line surfing and to increase writing efficiency.	4.36	1.082	4.57	0.756
16. I enrich my writing by fully using on-line sources.	3.93	0.997	4.00	0.555
17. I modify improper vocabulary and grammar based on screen prompts.	3.93	1.269	3.79	1.051
18. I ignore screen prompts and make no modifications and disruptions over writing,	3.93	0.917	3.86	0.770

The records of the Pigai Network also offered some clues: these less-skilled participants were not usually the first to post their writings, with modifications of the original version being much lower than the average. When asked the reasons, the interviewees recalled that English writing was a much harder skill in which to make obvious progress in a short time. Deficiency in writing knowledge, coupled with their weaknesses in vocabulary, grammar and syntax, set barriers to active corrections of their flawed essays. In addition, suggestions from the Pigai Network dominated in indirect feedback [2], sometimes successful self-corrections beyond their ability. All could contribute to their loose attitude towards writing assignments. Given high frequency use of knowledge application and emotion regulation in both groups, it can be concluded that students of various levels of writing proficiency have the potential to associate what is acquired with what is required in EFL writing and to adjust personal negative moods, which can be transferred in more complicated writing tasks in the future.

The rest of the items were at the intermediate level for the higher group, including on-line dictionary use (4.14), behaviour self-monitoring (3.21), theme-relevance examination (3.64), goal keeping (3.71), content enriching (4.00), vocabulary/grammar modifications (3.79) and writing without disruption (3.86). Among these, behaviour self-monitoring was the lowest, corresponding with its position in the lower group: even falling into low frequency use (2.71). In the face of diverse Web environments, students are always confronted with a great variety of distractions in their EFL writing. When English teachers are not available in out-of-classroom settings, engineering students have to take full responsibility for the writing activity, which requires high levels of self-discipline. However, it is not a natural gift, but is a learned skill through instruction. Although goal setting (4.43) was an advantage for the higher group in planning strategy, they were not strong executants in keeping up with the goals. Their poor performance in theme-

relevance examination (3.64) also contradicted what they acted in planning central ideas (5.36). Before receiving feedback from peers and teachers, engineering students can turn to no one except themselves and the Pigai Network for topic-relevance examination. The Pigai Network has been found to be less helpful in suggestions on this aspect [2][28][29]; thus, shifting the responsibility to individual students, who are restricted by their own language proficiency.

The same shortcomings were found in the lower group. In addition, vocabulary/grammar modifications (3.79/ 3.93) and writing without disruption (3.86/ 3.93) in the higher and lower groups were against the trend that the higher group always performed better than the lower group in self-monitoring strategy use. The interviews and data from questionnaires shed some light: the skilled writers were more linguistically capable, having a larger vocabulary and richer grammar, so modifications on linguistic performance were not priority concerns. Instead, they more emphasised the organisation, structure and content of the essay. During writing, the disruption mainly came from their higher consciousness of flaws and problems in the course of writing. Their sensitivity to wording, sentence patterns, consistency in ideas and logic of the content arrangements defied that of the less-skilled writers, whose corrections depended heavily on external clues from the Pigai Network.

An Analysis of Self-assessing Strategy between Two Groups

Table 5 displays similarities and differences between the higher and lower groups. Similarities lay in the performance of essay-assessing with the Pigai Network (4.93/4.86), coming to the high frequency use. Differences were drawn from the frequency use of the adoption of Web technologies (4.79/4.14), content of self-reflection (3.36/2.93) and means of self-reflection (3.29/2.79). In the higher group, the first item was highly used and the rest were intermediately used, while in the lower group, the first item was at the intermediate level and the other two were at the low level. According to the data, 86% of participants had a positive attitude towards the Pigai Network, 10.5% were uncertain of its effectiveness and only 3.5% negated the use of the Pigai Network. The majority agreed on its credible and reliable suggestions and comments, mainly on linguistic performance, such as vocabulary, collocation, grammar, syntax and spelling. The Pigai Network was confirmed as being conducive to higher quality essays and students' increased sensitivity to errors, avoiding future repetitions.

Table 5: Descriptive statistics of self-assessing strategy use between two groups.

Items on self-assessing strategy use	Lower group		Higher group	
	Mean	SD	Mean	SD
After I finish an essay on the Pigai Network				
19. I make modifications of, ask questions about, and seek assistance on the essay writing by utilising Web technologies.	4.14	0.949	4.79	0.699
20. I re-examine and assess the essay with the aid of the Pigai Network.	4.86	0.864	4.93	1.072
21. I reflect on my writing process and compare the product with the writing goals in the hope of future improvement.	2.93	1.207	3.36	1.216
22. I write journals on Web-based autonomous learning for self-reflections.	2.79	0.893	3.29	0.914

Compared to the lower group, the higher group utilised Web technologies more frequently for solutions to writing difficulties and knowledge reserve. Interviewees from the higher group reported that they turned to search engines for the collection of materials related to the topic, on-line dictionaries for a variety of expressions, sources for supplementing and strengthening grammar, quotations for citation or support of personal views and other on-line sources for English language learning. Those from the lower group relied on Web technologies mainly for spelling and translation of expressions or sentences. The shared weaknesses in content and means of self-reflection exposed ineffective measures of supervision on the post-writing stage on the part of English teachers.

Generally, teachers in class mainly impart writing knowledge, including writing genres and corresponding features, classic layouts and typical sentence structures, and general writing devices. Due to the large size of college English classes in China, teacher feedback is quite limited and tends to be concentrated on universal problems, meaning that bright points in individual essays are hard to cover. Inadequate comprehensive demonstrations, explicit requirements and detailed instructions lessen students' opportunity and capability to reflect upon their own essays, in turn precluding them from knowing specific strengths and weaknesses in their writing and taking countermeasures.

CONCLUSIONS AND SUGGESTIONS

The present research, sampling 57 engineering majors in a Chinese local university, conducted a survey on the use of metacognitive strategy and three sub-strategies in Web-based EFL writing. It was found that students' holistic metacognitive strategy use was at the intermediate level, with planning strategy best, self-assessing strategy worst and

self-monitoring strategy in between. The contrastive analysis of the metacognitive strategy and use of the three sub-strategies between groups of lower and higher writing proficiency revealed that the holistic performance of the latter was unanimously better than that of the former on holistic metacognitive strategy and three sub-strategies. The only strategy of high frequency use went to planning in the higher group, and the other sub-strategies in both groups stayed at the intermediate level.

There existed a difference in distribution of metacognitive strategy and use of the three sub-strategies between two groups: the position of self-assessing and self-monitoring. Further contrasts and comparisons between the two groups were made on specific items of sub-strategies, disclosing differences and shared weaknesses in engineering students' English writing in Web-based environments: for students of lower writing proficiency, setting goals, writing arrangement, awareness of self-corrections and the adoption of Web-based technologies lagged far behind. For all the lower-intermediate students, sentence structures and material collection in planning strategy were less desirable; obvious disadvantages went to behaviour self-monitoring, theme-relevance examination and goal keeping in self-monitoring strategy; shortcomings were also detected in content and means of self-reflection in self-assessing strategy.

On the basis of the findings above, the present research proposes the following pedagogic suggestions:

Firstly, English writing teaching in class should incorporate metacognitive strategy intervention and instruction to foster and reinforce students' consciousness of the stages involved in the EFL writing process, which is especially beneficial for English writing in Web-based environments, which requires high self-regulated learning capability. Compared to the planning strategy, more emphasis should be attached to self-monitoring and self-assessing strategies in teachers' intervention and instruction.

At the planning stage, it should be made clear to students of lower writing proficiency that EFL writing is a goal-directed process. When a writing task is assigned on-line, teachers should clarify the purposes, expectations and possible strategies involved in stages of the composing process. Explanations, demonstrations, questions and requirements should be given to guide less-skilled students in setting their own writing goals in tasks. With the immediate goals, the long-term goals can be fulfilled over time. For all the lower-and-intermediate students, the Internet should be advocated as the information pool for brainstorming ideas and enriching contents on the topic. To increase the efficiency, material collection should be demonstrated, the process and experience shared, so that students can remain goal-focused and avoid getting lost during on-line search. To plan natural, clearly-organised and legal sentence structures requires daily accumulations from intensive reading; thus, explaining and emphasising the key sentence structures of reading materials should be stressed in college English teaching design.

At the self-monitoring stage, special attention should be paid to writing arrangement and awareness of self-correction for students of lower writing proficiency. To change their loose attitude towards English writing assignments, English teachers should set the minimum score of the first assignment every semester, with scores raised in the subsequent four assignments. The rule for the minimum number of self-corrections based on suggestions and comments from the Pigai Network should be made and notified. In addition, requests can be made on students' recordings of types and contents of corrections for teachers' random examination.

The checklists should be provided for all the students of lower-and-intermediate English proficiency to track their writing behaviour: what strategies are used, how they are used and what effects they exert, etc. If any deviation or slip is found, the former behaviour should be regulated to meet the goals. The continuous use of the checklists can scaffold students to create a pattern of self-monitoring. Instructions should also be put on the analysis of the theme development of texts. For instance, teaching activities can draw students' attention on the purpose of texts, topic sentences in paragraphs and parts, the transition devices within, writing strategies and their contributions to theme development. To ensure effective learning results, the Internet should be fully utilised as a tool for queries, discussions, explanations and feedback. With frequent practice and application, students' strategy use can be built up of theme-relevance examination.

Finally, at the self-assessing stage, students with lower writing proficiency should learn how to use Web-based technologies effectively for both the completion of tasks and for knowledge reserve of English learning, also as a means to learn from teachers and successful peers. Communication, demonstration, practice, questioning and explanation can serve this end. To guarantee the effects of self-reflection in means and contents for all the lower-and-intermediate students, journals should be required and submitted for teacher feedback. This practice aims to help students build the habit of discovering, learning and analysing strategies for success and failure during Web-based EFL writing process, so that regulations afterward can be effective. Representative [30] and model samples from peer students can serve as valuable input and reference for self-assessing essays, with rubrics as guidance. Since metacognitive strategy is a transferrable domain-general skill [14], its development can raise engineering students' English writing competence and further benefit their overall English learning.

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