

## The Neglected Writing Style of Mathematical Modeling Essays

WANG Leyang<sup>[a],\*</sup>

<sup>[a]</sup>Lecturer, English Department, North China Electric Power University, Baoding, China.

\*Corresponding author.

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### Abstract

In modern society, academic exchanges are mainly processed in the style of English for Academic Purposes. Western countries have long been attaching importance to EAP teaching, while China just begins to teach EAP in the recent decade. With the purpose to enhance the quality of EAP teaching in China, Chinese publishers have published several sets of textbooks on EAP, most of which illustrate the following language features: formality, complexity and objectivity. However, those textbooks seldom discuss the unique writing style of mathematical modeling essays. Despite the fact that these essays are also written in a formal style, complexity and objectivity do not seem to be their focus. In fact, simplicity and subjectivity are considered as the two accepted unique stylistic features of mathematical modeling essays. This leads to the embarrassing result that most of mathematical modeling essays by Chinese authors are written according to the common features of other academic essays. It may deter academic exchanges of Chinese scholars with their counterparts from foreign countries. Therefore, Chinese teachers who teach EAP are required to be aware of the differences between mathematical modeling essays and other common academic essays.

**Key words:** EAP; Writing style; Mathematical modeling

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### INTRODUCTION

In modern society, English has been established as the most widely used language of research and publication. An increasing number of universities and institutes of higher learning are currently using English to instruct students. Scholars from different cultural backgrounds tend to exchange their academic ideas in English. And about 80% of the academic articles across the world are published in this language. In recognition of this important development, universities and institutes attach serious attention to the teaching of the writing style of English for Academic Purposes, a term shortened as EAP. It is no doubt that western countries, such as America, Canada, and Britain take the lead in EAP teaching. EAP writing skills have already been taught and emphasized in those countries for several decades. Now, nearly every college student there has read at least one textbook on EAP writing skills and been trained to grasp the EAP style. Even high school students have already been trained to present academic ideas in their assignments. While China starts very late on this aspect, where EAP has been taught since just a decade ago. But EAP teaching develops at a fast speed in China. With the advent of flourishing international academic exchanges, there are more and more Chinese universities and institutes that have reformed and are reforming their English teaching program. The focus of English teaching in China changes from teaching English grammar to teaching EAP writing style.

To meet the demand of rapidly enhancing the teaching quality of EAP in China, various textbooks have been

published like mushrooms. Yet until now, it seems that few textbooks on EAP have touched the unique and distinctive writing style of mathematical modeling essays. At the same time, college teachers who teach EAP seldom illustrate the uniqueness and distinctiveness of the essays on mathematical modeling, because it is beyond the extent of their knowledge. Almost all those teachers, who have very limited amount of mathematical knowledge, major in English linguistics or literature.

Unfortunately, the lack of knowledge on the writing style of mathematical modeling essays may deter many Chinese college students from winning prizes in international contests of mathematical modeling. Take the American Mathematical Contest in Modeling (MCM) as an example. It is an international mathematical event held annually, where undergraduate students from different countries form teams to work out mathematical models to solve thought-provoking mathematical problems. They apply their abstract mathematical knowledge to various open-ended problems which are of great practical significance. Each year thousands of Chinese college students take part in it and many of them can win an award.

It is required that solutions of MCM participants should be presented in English and written in the form of academic research papers. It can be rationally concluded that this contest is as much a contest in clear English writing as it is in abstract mathematical modeling. To some extent, students' English writing quality weighs more than their mathematical modeling ability. Unfortunately, what their English teachers have taught in class on academic essay writing tends to be contradictory to the requirements of essays on mathematical modeling. So it is quite impossible for students to have the opportunity to grasp the writing style of mathematical modeling essays. Neither their English teachers detail it, nor EAP textbooks available provide the necessary instructions for it. For the sake of promoting the international academic exchanges within the field of mathematics, the stylistic features of English essays on mathematical modeling are hereby analyzed.

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## 1. GENERAL STYLISTIC FEATURES OF EAP

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In the recent decade, various textbooks on EAP have been published in China, some composed or edited by Chinese scholars, some introduced directly from foreign countries. They are mainly divided into three types: on general stylistic features of EAP, on stylistic features of a specific discipline, on stylistic features of a specific subject.

Textbooks on general stylistic features of EAP aim to train students of different majors on their academic writing ability step by step. At the beginning, students are trained on how to write expository essays, then how

to make argumentation, last how to write a complete and unabridged academic essay which can be published in academic journals. This type of textbooks usually does not take into account the structural diversity of academic essays in different disciplines. What matters most in this type of textbooks is the general language features of EAP. In certain circumstances, traditionally acknowledged language abilities, such as listening, speaking, reading and writing are trained respectively. One of the representative textbooks is *English for Academic Study* by John Slaght, introduced into China in 2015 by Foreign Language Teaching and Research Press. It includes listening, speaking, reading and writing volumes.

Textbooks on stylistic features of a specific discipline always contain a set of books, each focusing on a specific discipline. Teaching materials have been selected from academic essays of the corresponding discipline. Besides expository and argumentative writing skills, the unique structure of academic essays within the field of the same discipline is detailed in this type of textbooks. One of the representative textbooks is *Series Textbooks of English for Special Purposes for Institutions of Higher Learning*, published by Foreign Language Teaching and Research Press in 2012. It includes 6 volumes: *Academic English for Science and Engineering*, *Academic English for Humanities*, *Academic English for Business*, *Academic English for Medicine*, *Academic English for Social Sciences* and *Academic English—an Integrated Course*. The last volume targets students whose majors do not belong to the previous five disciplines.

The last type of EAP textbooks is designed for students of different majors. Its primary purpose is not to train students to write a complete academic essay that will be published in an academic journal, but to familiarize students with frequently used technical expressions in their majors. One of the representative textbooks is *Subject Based English* published by Foreign Language Teaching and Research Press in 2012. It includes *English for Economic Sciences*, *English for Computer Science and Technology*, *English for Electrical and Electronic Science and Technology*, *English for Machinery*, *English for Material Science and Engineering*, *English for Energy and Power*, *English for Management Sciences*, *English for Medicine*, *English for Agricultural Sciences*, and *English for Humanities and Social Sciences*.

The three types of textbooks mentioned above all share a common content: language features of academic essays, which include but are not limited to formality, complexity and objectivity. There are other language features, but they are not within the scope of discussion in the current essay.

In order to present ideas academically, formal expressions are preferred to colloquial and informal ones. English has such a large vocabulary that different expressions can be employed to express the same idea.

Authors, therefore, are encouraged to choose formal forms at both the lexical and syntactic levels whenever possible and necessary. Furthermore, academic essays conform to certain conventions in order to reduce informality.

At the lexical level, besides technical terms in specific disciplines, there are more formal English words than informal ones. For example, the formal verb “depart” is preferred to the informal one “go”, adjective “incorrect” to “wrong”, noun “assistance” to “help”, and words of other parts of speech. When the meaning of an action is expressed, the form of a single verb tends to increase the degree of formality over a phrasal or prepositional verb. For example, in the sentence “An autopsy was being done to establish the cause of death”, the verb “establish” sounds more formal than “set up”, although the two express the similar meaning.

Academic writing conforms to some syntactic rules for the sake of formality. Firstly, the informal negative forms “not... any”, “not... much”, and “not... many” seldom appear in academic essays. Secondly, direct questions in hard sciences do not sound formal. They are usually transformed into declarative forms. For example, “Why does the brain function that way?” is usually transformed into “Many studies have examined the reason why the brain functions that way.” Thirdly, the use of “run on” expressions such as “and so on” and “etc.” is limited. After comparing the following two sentences: “Hydrogen can be used in gas turbines, fuel cells, etc.” and “Hydrogen can be used in gas turbines, fuel cells, and other applications.” it is reasonable to draw a conclusion that the latter is formal. Fourthly, in academic essays, sentences rarely start with such conjunctions as “and”, “but”, “so”, and others conjunctions indicating simple logical relationships. Academic essays are abundant in logical reasoning. If each step of reasoning has to be indicated by conjunctions, essays will for sure be full of conjunctions. Admittedly, academic essays present complicated reasoning processes, but only those that suggest conspicuous changes of logical reasoning will be indicated by conjunctions, leaving simple and potential reasoning comprehended and inferred by readers themselves. Finally, adverbs are usually placed within verbal expressions rather than at the initial or end place of a sentence.

Certain conventions can reduce the informality of academic essays. To begin with, most authors of academic essays refrain from contractions, such as “can’t”, “doesn’t”, “they’ll”, to name just a few. What is more, despite the fact that certain abbreviations, such as Mr. and e.g. are acceptable in academic writing, the complete form of words is preferred. Authors should avoid most abbreviations. Thirdly, certain rules are helpful for using numbers. Numbers containing no more than two words are required to be spelt out. Otherwise, authors have to use the Arabic numbers. It is finally worth mentioning that consistency is important when a series of numbers are

placed in a sentence or paragraph. If some numbers in the same sentence or the same paragraph require more than two words, the others that can be spelt out in less than two words should be presented in numbers instead of being spelt out.

Complexity is the second language feature of academic essays. In general, the expressions are complex both lexically and syntactically.

At the lexical level, there are three salient features of academic essays on the aspect of complexity. Firstly, a great number of longer and denser words are used. Secondly, the proportion of lexical words outweighs that of grammatical words. The last but not the least, nouns, nominal phrases and nominalization are prevalent. EAP presents an overwhelming feature of phrasal modifications, particularly noun phrases. For instance, in the phrase “for male and female target students” the nominal phrase “for male and female target” modifies the noun “students”. In common language, the meaning may be expressed in a clause “target students that include both male and female”. Phrasal modifications sound more complex. It is reported that EAP prefers noun-based phrases to clauses when more information is needed to add on.

At the syntactic level, academic essays employ more clauses than common language to illustrate complicated ideas. Take a sentence from the abstract of an essay as an example: “Analysis shows that variable definitions of plagiarism exist; both regarding student activities that constitute plagiarism and the way in which plagiarism is perceived to be related to cheating.” The embedded clauses such as “that constitute plagiarism” and “in which plagiarism is perceived to be related to cheating” increase apparently the complexity of this sentence.

The last important language feature of EAP to be discussed is objectivity. Lexically, the subject of an active voiced sentence usually suggests who has made the action. To ensure the objectivity of academic essays, writers often avoid the first person pronouns “we” and “I”, because the two suggest that the viewpoint comes from the writer himself rather than from an objective experiment or observation. Therefore, the third person pronouns are considered as the most appropriate subjects. Sometimes, phrases like “this paper”, “current study”, “present study” are usually selected as subjects to avoid using the first person pronouns. In addition, at the syntactic level, passive voiced sentences are used more frequently than active voiced sentences, for actors of an action can be omitted in passive voiced sentences. Besides the first person pronouns, the second person is seldom used. Academic essays tend to avoid addressing the reader as “you”. It sounds like a personal communication between the author and the reader which takes place in a private situation. The second person pronoun may greatly reduce the objectivity of academic essays.

Almost all EAP textbooks attach great importance to these three language features: formality, complexity and objectivity. If authors of academic essays conform to the three language features, it is believed that they can present their ideas in a scientific and objective way. However, exception does exist in academic essays. Essays on mathematical modeling do not follow the rules mentioned above.

## 2. UNIQUE STYLISTIC FEATURES OF MATHEMATICAL MODELING ESSAYS

Essays on mathematical modeling have certain conventional styles. Despite the fact that these essays are written in a formal style, complexity and objectivity do not seem to be their focus. In fact, simplicity and subjectivity are considered as the two accepted unique stylistic features of mathematical modeling essays.

Simplicity, rather than complexity, is one of the language features in mathematical modeling essays, which is reflected mainly at the syntactical level.

There are more clauses in common academic essays in order to express complicated information and logical reasoning, while the sentences in mathematical modeling essays are as simple as possible, one sentence describing only one idea. In those simple sentences, the verb tends to be close to the subject. If complicated ideas or logical reasoning are to be expressed, they are often broken into simple sentences.

Mathematical modeling essays are allowed to express ideas from a subjective viewpoint.

At the lexical level, academic essays seldom use first person pronouns for the sake of objectivity, while essays on mathematical modeling are typically written in the first person plural. Throughout the essays, a large number of sentences choose “we” as the subject, even the conclusions are presented with first person pronoun plural. “We” does not refer to the author and coauthors but rather to the author and coauthors along with the reader. The first person pronoun plural has some advantages. On the one hand, it sounds friendly, able to shorten the distance between the author and the reader. On the other hand, it is more convenient. In doing so, the author and the reader do not need to be specifically referred to. The pronoun “we” is adequate to make appropriate addressing.

Syntactically, academic essays generally prefer passive voice to active voice, while essays on mathematical modeling can employ more active voiced sentences to describe ideas and facts. In an active voiced sentence, the subject plays the role of the doer of an action. Take the sentence “The model produced a desirable conclusion.” as an example. The producer of the conclusion is the “model”. The active voice emphasizes the important role the mathematical model plays. However,

in other academic essays, passive voiced expressions like “it is concluded that” are very common. Who draws the conclusion is usually omitted in order to present an objective viewpoint.

Although the two unique features: Simplicity and subjectivity are contradictory to the common features of other academic essays, they accord with the purposes of mathematical modeling essays.

## 3. REASONS OF THE UNIQUENESS

The unique style of mathematical modeling essays originate from their specific purposes. The focus of such essays is the modeling rather than the writing, although the writing quality carries an extraordinary importance. At the same time, the problems ready to be solved are unquestionable facts that exist in the objective world. But the solutions are to a large extent dependent on the subjective perspective and reasoning of the authors.

In mathematical modeling essays, the mathematical formula and mathematical modeling are prior to the writing skills. Readers may feel uncomfortable to be forced to slow down to parse the complicated sentences or make inference to explore what the author means. Simple syntactic structures can convert readers’ focus from sentences to mathematical formula and modeling.

When dealing with the same problem, different authors of mathematical modeling essays usually establish various modeling to investigate the solutions. On this aspect, mathematical modelings essays are quite different from other academic essays, where one of the purposes is to ensure that readers can repeat the experiment and draw the same conclusion. Accordingly, authors of other common academic essays present their ideas in an objective manner, for fear that any degree of subjectivity may prevent readers from repeating the experiment or drawing the same conclusion. However, mathematical modeling essays aim to present how the authors address the problem in their unique way. It is natural to draw a conclusion that the use of first person pronoun plural can meet the demand of mathematical modeling essays. Besides, mathematical formula and models are too abstract. The use of first person pronoun plural can make readers feel comfortable and friendly, making it easier for them to accept the abstract and complicated mathematical formula and models.

## CONCLUSION

Mathematical modeling essays share some similarities with other common academic essays, especially the language feature of formality. However, this kind of essays is unique on certain aspects. Other common academic essays prefer complexity in syntactic structures, while mathematical modeling essays value simplicity

more highly. Subjective viewpoint, embodied in the use of the first person pronoun, is forbidden in other common academic essays, while the first person pronoun plural appears very frequently in mathematical modeling essays.

The reason why mathematical modeling essays have a different writing style lies in their unique purposes. Mathematical formula and modeling, rather than writing, are the focus of mathematical modeling essays. Simple syntactic structures play the role of directing readers' attention to the formula and modeling, instead of writing. Modeling aims to solve practical problems. When dealing with the same problem, different authors may have various solutions. So using the first person plural to address both the author and the reader can make readers feel comfortable and friendly, and at the same time it can reflect the unique way in which the author addresses the problem.

With the flourishing and rapid development of academic exchanges across the world, EAP teaching is becoming increasingly popular and important. Yet, China lags a little behind western countries on this aspect. Almost all EAP textbooks already published in China detail such language features as formality, complexity and objectivity, but they may neglect the unique stylistic features of mathematical modeling essays. This leads

to the embarrassing result that most of the Chinese students, the future scholars, write their mathematical modeling essays according to the common features of other academic essays. They use complex sentences and the third person pronouns, rather than simple ones and the first person pronoun plural. Therefore, Chinese college teachers who teach EAP have to be aware about the stylistic differences between mathematical modeling essays and other academic essays. This will bring about many benefits to Chinese scholars who desire to exchange their mathematical ideas with other scholars in the world.

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