THE USE OF MODAL AUXILIARIES AS HEDGING DEVICES IN CHINESE RESEARCH ARTICLES

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THE USE OF MODAL AUXILIARIES AS HEDGING DEVICES IN CHINESE RESEARCH ARTICLES

ABSTRACT

The study uses the modal auxiliaries as the principal strategy to find out its variation in Chinese research articles. The study's goal is to provide a common view for selecting Chinese modal auxiliaries, which will serve as a reference for researchers as they work to enhance their articles. The research took six representative main modal auxiliaries of hedges in Chinese as the research objectives and researched their frequencies and distributions in 40 Chinese research articles from four different disciplines. Based on the previous studies, the research proposed and answered four research questions and analyzed the data in a comparative way. It is found that if the context is as concrete as possible, the Chinese modal auxiliaries would achieve semantic equivalence with English in academic discourse. Besides, the article summarized and discussed the scholars' preferences about modal auxiliaries used in research articles.

Keywords: Hedging Device; Modal Auxiliaries; Academic Discourse; Chinese Research Article

PENGGUNAAN KATA KERJA BANTU SEBAGAI PERANTI LINDUNG NILAI DALAM ARTIKEL PENYELIDIKAN CINA

ABSTRAK

Kajian ini menggunakan kata bantu modal sebagai strategi utama untuk mengetahui variasinya dalam artikel penyelidikan Cina. Matlamat kajian ini adalah untuk memberikan pandangan umum untuk memilih alat bantu ragam bahasa Cina,ini akan menjadi rujukan kepada penyelidik semasa mereka berusaha untuk meningkatkan artikel mereka. Penyelidikan itu mengambil enam wakil modal tambahan utama lindung nilai dalam bahasa Cina sebagai objektif penyelidikan, menyelidik kekerapan dan pengedarannya dalam 40 artikel penyelidikan Cina daripada empat disiplin berbeza. Berdasarkan kajian lepas, kajian mencadangkan dan menjawab empat persoalan kajian serta menganalisis data secara perbandingan..Didapati bahawa jika konteksnya hambir sespesifik kata bantu ragam bahasa Cina akan mencapai kesetaraan semantik dengan bahasa Inggeris dalam wacana akademik.. Selain itu, artikel tersebut meringkaskan dan membincangkan keutamaan ulama tentang bahan bantu modal yang digunakan dalam artikel penyelidikan.

Kata kunci: Peranti Lindung Nilai; Bantuan Modal; Wacana Akademik; Artikel Penyelidikan Cina

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Always.

TABLE OF CONTENTS

TABLE OF CONTENTS

FIGURE OF CONTENTS

FLOW CHART OF CONTENTS

CHAPTER 1 : INTRODUCTION

1.0 Introduction

The introduction chapter introduces the main idea of the study. It will also introduce the research objectives, research questions, research gap, the significance of the study and background of the study.

1.1 Research Background

Hedges, defined by Lakoff (1973), explained that a group of lexicons acted to make matters vaguer or less vague. In general, hedges are regarded as a group of words to express uncertainty. In daily communications, the hedges play a significant role in expressing speaker's feelings. If the hedges are not informal communication, the speaker may sound too absolute or aggressive. It directly influences the listener's reactions and receptions. It is known that even minor elements will influence the communication's quality, resulting in misunderstandings. For western people, people from English speaking countries, for example, tend to express more frankly and straightforwardly. However, Chinese people always tend to express themselves euphemistically, to avoid hurting someone or having too much confidence. This kind of behaviour is regarded as impolite behavior in China. This is a cultural difference between eastern and western cultures, which resulted that they used hedges differently in some situations both in oral communication and written articles.

Thus, hedges appear in many casual situations and scholarly journals to ease language misunderstandings in worldwide communications. For most scholars, learning how to use the hedges suitably can develop their quality of journals. Yang (2013) showed that the hedging devices are universal in academic writing for conveying cognitive logic relation, which refers to "epistemic modality" and interpersonal function. Epistemic modality refers to the way speakers communicate their doubts, certainties, and guesses. It represents the attitudes and cognition of the speakers or writers. Hedges in academic

writing played a significant role in conveying the messages, which are not straightly written in the papers. Regarding Hyland's study Hyland (1998), hedging devices are the most universally interpreted by dictionary verbs, epistemic adjectives, epistemic adverbs and modal verbs. Many research articles talk about the English hedges used in different disciplines, but not enough articles focus on the Chinese modal auxiliaries in Chinese research articles.

The research concentrated on Chinese modal auxiliaries as hedges. He (1985) classified the hedges into the Approximators and the Shields. The type of plausibility of hedges is one of the Shields. The plausibility of hedges is a direct speculation or the doubtful attitude of the speaker. It must be overlapped with the modals. Among the models, the modal auxiliary verbs have a significant position but often been ignored. This research also focuses on the modal auxiliaries in Chinese research articles and gives an expandable view in using them as hedges in distinct disciplines. More and more Chinese and overseas scholars studied the use of modals, but still not enough studies focused on the modal auxiliaries on hedges, especially in Chinese. Instead, the scholars pay more attention to research or modal verbs use only, which ignores the minor but significant thing: modal auxiliary. More than that, there is less research on the use of Chinese modal auxiliaries of hedges as well. The research was inspired by the study proposed by Hardjanto (2016), who did research to examine the hedges throughout the strategy of modals auxiliaries in English scholarly journals and found out that the hedges are most frequently used in the discipline of linguistics and least frequently used in the discipline of natural science in English journal articles. The author predicted that social and art-science used hedges more frequently than science and engineering science in English research articles, and the results evidenced that. Yet, this study focused on the English academic discourse fields, but English and Chinese belong to different language systems. It is amusing and necessary to see

whether the results would be the same as them in Chinese, and study how Chinese scholars adopt the Chinese modal auxiliaries to reach the semantic and pragmatic use simultaneously.

After reading materials about the hedges on the use of modal auxiliaries and their uses in different disciplines previously, it is found that He and Wang (2013), studied the modality markers, which are based on corpus-based in Chinese research articles. Chinese scholars attached importance to the hedging strategies in Chinese research articles, which also considered the cognition's influence. The paper in 2012 put forward the epistemic modality markers (EMMs), which compared the frequency of the use of EMMs in the three research fields: linguistics, medicine and aerospace. The study had three main findings: firstly, the different fields did not influence the use of EMMs in Chinese research articles. Second, compared to Western research articles, the cultural influence on the frequency use of EMMs is more heavily in Chinese research articles. Chinese research articles are inclined to use low uncertainty avoidance. Later, Yang (2013) showed that the hedging devices are universal in academic writing for conveying cognitive logic relation, which refers to "epistemic modality" and interpersonal function. Hu and Cao (2011) researched several linguistics articles. It is shown that journals published in Chinese used fewer hedging devices than journals published in English. Much more research and papers analyzed the hedging strategies between English and Chinese research articles. However, as mentioned above, whether they are Chinese or foreign scholars, the research of modal auxiliaries based on the hedges of Chinese research articles only is rare. Yang (1998) stated that English papers used more modal auxiliaries than Chinese, because Chinese does not have enough words to describe the possibilities. On the other hand, Chinese modal auxiliaries are not as rich as English vocabulary.

Mentioned above, many previous studies show that Chinese modal auxiliaries are worthwhile for researching their uses and value in academic writings. Also, the cognition influences arouse the author's interest to research the semantic and pragmatic equivalence between Chinese and English modal auxiliaries.

1.2 Research gap

Indeed, compared to the English writing styles, the Chinese writing style is originally euphemistic and careful, but Yang (1998) found that English papers used more modal auxiliaries than Chinese, because Chinese does not have enough modal words to describe the possibilities. It is seen that the modal auxiliaries are not the primary hedges strategy in Chinese research articles. Even though, as one of the primary strategies of hedges, it still occupies a significant position in the hedging applications.

Considering the previous findings of Chinese hedges, the modal auxiliaries are often ignored by the Chinese hedges studies because they occupied a small number in the paper compared with the approximates of hedges in journals of engineering and calculation fields. Most of the papers about Chinese hedges taking the data-oriented disciplines as selected corpus, and few mentioned that the corpus in social and art-science fields used modal auxiliaries. Erton (2018) stated that modal auxiliaries should be taught their lexical meanings and their social pragmatic meanings, and help learners learn it in semiotic environments. The scholar also added that the modal auxiliaries play a vital role in research papers and have significant functions on 'learners' cognitions especially.

More than that, many papers about Chinese hedges took the data-oriented disciplines as selected corpus, and few mentioned that the corpus in social and art-science fields used modal auxiliaries. T. D. 's (2016) research supported his hypothesis that the hedges are most frequently used in the discipline of linguistics and least frequently used in the discipline of natural science in English journal articles. Which aroused the gap. Is it

possible that the hedges are most frequently used in the discipline of linguistics and least frequently used in the discipline of natural science in Chinese research articles like T.D. 's research results in English. If so, are there any differences in uses of modal auxiliaries as hedges in Chinese research articles? And how do the Chinese scholars resolve the problem that the vocabulary of modal auxiliaries in Chinese are not as rich as those in English and what are their preference on the choices of modal auxiliaries in Chinese research articles? The previous research didn't give adequate explanation about the use of Chinese modal auxiliaries in Chinese research articles. According to the findings, the study decided to research the Chinese modal auxiliaries in Chinese research articles and proposed the following questions.

1.3 Research objectives

For filling the mentioned research gap, the objectives of this research are:

(1) To identify the Chinese modal auxiliaries of hedges in Chinese research articles.

(2) To identify the Chinese modal auxiliaries of hedges in Abstracts of the Chinese research articles.

(3) To explore if the Chinese modal auxiliaries as hedges can reach semantic equivalence with English.

(4) To describe the preference of the scholar's selection of the Chinese modal auxiliaries of hedges in research articles.

1.4 Research questions

The research questions are:

(1) What are the frequency and distribution of the Chinese modal auxiliaries as hedging devices in the journal articles from the four main branches of the discipline?

(2) What are the frequency and distribution of the Chinese modal auxiliaries as hedging devices in the abstract parts of the journal articles from the four main branches of the disciplines?

(3) What are the conditions that enable Chinese modal auxiliary words as hedges to. achieve semantic equivalence with English?

(4) Why Chinese scholars frequently use these Chinese modal auxiliaries as hedges in the journal articles from the four main branches of the discipline, and why?

1.5 Research significance

There are some research significances illustrated as follows:

Firstly, hedging devices are used to lessen assertiveness, mainly applied in academic writings worldwide. Different languages have different words to achieve this goal. In English, the studies on hedges in academic discourse are rich and mature, but in Chinese, the studies on hedges are not as rich as in English. On the one hand, the vocabulary of hedges in English is much more. On the other hand, Chinese is a kind of hedging language, which means their language style is vague and euphemistic, so in most situations, they don't need to use specialized words to express the uncertainty. Instead, Chinese people are inclined to use tone to express.

Secondly, the classification of hedges is not classified as detailed as English. In the modern world, scholars commonly accept the classification of English hedges. Zhao and Sun (2014) considered the previous findings of Chinese hedges, the modal auxiliaries are often ignored by the Chinese hedges studies because they occupied minimal numbers in the paper compared with them appearing in English journals. The study gives feedback to the researchers that the modal auxiliaries as hedges should not be ignored totally. Even though they do not appear very often in the Chinese research articles, they still have their functions and help the readers and writers understand each other better.

Y. L. Zhao (1999) stated that it's unclear how many percentages that possibility is occupied in the sentences, but it still makes the sentences more vigorous and scientific. Thus, it was evident that the Chinese modal auxiliaries as hedges influenced the

Chinese academic writings. Besides the accuracy-oriented hedges, including the modal auxiliaries, she put forward the other two hedging strategies. They are writer-oriented hedges and reader- oriented hedges. In most Chinese research, the modal auxiliaries are not the main research objectives. When the writers consider the hedges, it needs to be analyzed in detail, even though they are a small part of Chinese research articles. Thirdly, the Chinese modal auxiliaries as hedges connected with the scholar's cognition, they used them depending on their context. If the writer wants their article to be more scientific, especially when they present it to the readers, the understanding of the context to the writers is significant. Thus, it is important to find out the most suitable word for expression.

1.6 Introduction summary

In summary, this part introduced what the study will conduct and what inspired the author to do this research. It is significant to do the research and the research questions would be answered and analyzed in the following chapters.

CHAPTER 2 : LITERATURE REVIEW

2.0 Introduction

This part introduces the definition and previous studies of hedges including its functions and research implications and its classification, illustrates a general overview of the development of hedges, and the use of modal auxiliaries as hedging strategy in research articles. Among them, this part will emphasize the modal auxiliaries as hedges in research articles.

2.1 Definition and previous studies of hedges

"A fuzzy set is a class of objectives with a continuum of grades of membership." The American scientist L.A. Zadeh in 1965 proposed the concept of "Fuzzy sets" for the first time. He used examples to illustrate the concept of hedges, stating that "the class of animals includes dogs, horses, and birds, as well as their members, but excludes such objects as rocks, fluids, and plants." However, the same kind of ambiguity arises when a number such as 10 is a member of the 'class' of all real numbers greater than 1" (Zadeh, 1965, p. 338). After the concepts are articulated, numerous definitions of hedge are proposed by numerous scholars. A hedge was not an unfamiliar term in the linguistic field until Lakoff (1973) introduced hedges into the field. To some degree, he first defined the hedges as "words whose job is to make things fuzzier or less fuzzy" (Lakoff, 1973). He proposed the definition of hedges for the first time. The scholar introduced this expression to the world. Lakoff (1973) first defined the hedges and contributed the basis to the development of the hedge's studies in the linguistic area. Many scholars developed the definitions in the following years. Skelton (1988) pointed out the "unwelcome connotations" which the ordinary, "pejorative", meaning of hedge attracts and proposes the abandonment of the term, in favor of a distinction between proposition and comment. Hedging "a linguistic strategy allows the author to avoid committing the absolute truth of a proposition, statement or claim" (Crompton,

1997, pp. 271-287). He critically inherited Lakoff's definition of hedges. He proposed that different researchers have been obliged to offer their answers about the basic questions on hedges functions and forms. There is not an agreement to be achieved on the definition of hedges. Hyland K. (1998) published the book *"Hedging in Scientific Research Articles."* The book, the hedges are noted in the academic discourse. Hyland (1998) basically developed an improved theory to study the hedges. Here, the study took the definition of hedges developed by Lakoff (1973) and Hyland (1998). Hyland (1998), summed up the previous studying of hedges and drew that "hedges are how writers can present a proposition as an opinion rather than a fact: items are only hedges in their epistemic sense, and only then when they mark uncertainty." Hyland (1998) also explained why he focused on scientific hedging, that is because hedges are ample, and they are essential in academic writings. Hyland said in the book, "Hedges are a crucial means of presenting new claims for ratification and are among the primary features which shape the research article as the principal vehicle for new knowledge".

In English, Varttala (1999) classified the hedges into five types: Cognitive Modal Auxiliary Verbs, Cognitive Modal Verbs, Cognitive Modal Adjectives, Cognitive Modal Adverbs, and Cognitive Modal Nouns. The study is to take modal auxiliary verbs as the main research objectives. The research investigated one of the important strategies of hedges: modal auxiliaries, to find out their applications and functions in four main branches of disciplines. The study centered on the pragmatic use of the modal auxiliaries in academic writing, which offered a good view for the Chinese and overseas scholars to adopt different modal auxiliaries to improve the quality of the essay.

2.2 Hedges classification and functions

Hedges as the strategy are to lessen the assertiveness of the articles or speaker's tone. It is known that the linguist E.F. Prince in a pragmatic way to propose the approximators and shields. The former is used for the content of the proposition itself, while the latter is used for the relationship between the proposition and the 'speaker's content and the 'speaker's attitude. The Approximators can be classified as adapters and rounders, and the Shields can be classified as plausibility and attribution. He (1985) also classified the hedges into two types: the Approximators and the Shields. His classification is like E.F. Prince's classification. The Approximators take an example as "His weight was *approximately* three point two kilograms, which is *essentially* what his birth weight was." The example words written in italic are cited from He Ziran in 1985. The Shields for example, is "She *might* be there." The word "might" in the sentence served as the function of "Shield".

Su (2002) not only developed He's study (1985), He also classified the Chinese hedges based on their grammatical class, which including adjectives, adverbs, numeral words, modal auxiliaries, independent clause, quantifiers, structural particles and intonation.

Varttala (1999) classified the hedges into five types: Cognitive Modal Auxiliary Verbs, Cognitive Modal Verbs, Cognitive Modal Adjectives, Cognitive Modal Adverbs, and Cognitive Modal Nouns. The classification is rounded with the modals, due this study focuses on the modal auxiliary's part. Also, it is considered the He zirang and E.F. Prince's classification, which divided the hedges into the Approximate and the Shields. The plausibility of the shields overlapped with the modal auxiliaries. Therefore, all of them are included in the plausibility as well. Among them, the modal auxiliaries serve as the study's research center.

2.2.1 Chinese hedges classification

Chinese hedges play an essential role in research papers. In addition, hedges in academic writing are an excellent tool to lessen assertiveness and help the papers be more precise.

Pieces of research classified the hedges, not only in semantic meanings but also in pragmatic use. For example, the Chinese scholars, Wu (1999) in the book of *"Fuzzy Linguistics",* distinguished the hedges into 4 types. In the book of *"Fuzzy Linguistics"* it is identified that most words in human languages are vague, so they are all hedges. He distinguished the Chinese hedges to four types: The first type is the word, such as "非常" "大部分" "大约", which means ("*very*" "*almost*" "*about*"); the second type is like suffix in English, for example: *"有点""稍微"*, which means ("*-ish*") in English; the third type is "*如此... 以至于...*" which equals to ("*so...that...*") in English; the last type is to express subjective opinions, often appeared with the clause. Wu's classification is mainly based on semantic meanings and English grammar structure.

Zhou and Wang (2008) studied English and Chinese hedges in abstracts of papers. She also used E. F. Prince's classification strategy, which divided the hedges into two pragmatic ways. They are approximators and shields. Furthermore, the scholars used the strategy to classify the hedges expression in English and Chinese.

In Chinese, the approximators for examples: "*较,基本上,一定,略微*" which means ("*higher, in general, basically, and barely*"). Moreover, the shields for examples: "*会, 可能,将*" which are equal to ("*will, might/may, likely*"). From that way, it is found that the modal auxiliaries belong to the shields in this classification. However, they are not experts on its uses. The scholar identified their functions and meanings according to the corresponding hedge types in English because Chinese hedges lack enough unique cultural elements and enough morphemes. Therefore, the hedges of modal auxiliaries in Chinese need their own classifications and studies. Furthermore, due to

the Chinese people's language habits, there are not so many modal auxiliaries to express the hedging functions, which are different from English.

Zhao (1999) studied scientific writing. The scholar divided the hedges into three types: the hedges inclined to accuracy, the hedges inclined to writers and the hedges inclined to readers. Y. Zhao (1999) explained the three strategies separately. The "accuracy-oriented" hedges strategies mainly included the downtoners, style disjuncts, attitudinal disjuncts, epistemic modal verbs, epistemic adjectives, and adverbs. Besides, the writer-oriented hedges, aims to reduce personal responsibility. To reach the aim, the strategies can be completed without the writer, impersonal expressions, or clausal subjects. Finally, the reader-oriented hedges are contrary to the writer-oriented hedges, which aim to reference the writer.

Here are two examples to illustrate Y. Zhao (1999) classification. The strategy of downtoners for example: "这个错误不完全是他导致的" (*This mistake is partially resulted by him*). Besides, the writer-oriented hedges aim to reduce personal responsibility. For example: *"在这种情况下"(Under this situation…)* This is to lessen the responsibility of the writers.

Zhao and Sun (2014) classified the hedges to two types——Degree of change and Range of change. The former one is considered in abstract writing; the author often uses degree-type hedges in order to make the presentation more precise and avoid criticism. The latter one is considered data and personal opinions. The change range is classified into two types based on their research: number mode (e.g., within 0.09mm), and descriptive mode (e.g., worldwide range).

Zhao and Sun (2014) conducted research, and their research objectives are 100 abstracts from engineering and social science, separately. They discovered that certain types of hedges appeared more frequently in social science papers. Zhao and Sun (2014) mentioned that it is necessary to see the pragmatic use of hedges in academic papers.

They supported that the hedges in the academic writings embodied the cooperative principle, polite principle and the writer's self-protection awareness. Zhang and Sun believed that the hedges served the above functions.

In Chinese, the modal auxiliaries help the speakers express their speculations and hesitations. To fulfill the need of the scholars, the above classification distinguished the Chinese hedges mainly in pragmatic or semantic ways. Most scholars set the standards depending on their semantic meanings or pragmatic functions. Setting an agreed standard is important because it satisfies the semantic and pragmatic use overall.

Zhao and Sun (2014) studied the hedges from abstracts and found out that the hedges performed the principle of cooperation and politeness. It is true that if the scholars want to pick up the most proper hedges in different research articles, they must meet the equivalence of semantic meanings and pragmatic use at the same time. Except that some Chinese hedges classifications are based on English hedges classification, it is vital to achieve the equivalence between Chinese hedges and English hedges as well.

Ma and Wang (2013) found that in the abstract of academic journals, taking textile papers as examples, the modal auxiliary verbs as hedges used the most often. This is because hedges themselves are the means of expressing vague modalities. According to Prince's theory, Zhao and Sun (2014) proposed that the Chinese hedges could be divided into variable hedges and moderate hedges. However, the latter is not considered too much in academic journals because Moderating hedges will reduce the scientific way and rigor of the paper itself. That's why scholars seldom use that strategy. As a result, the studies on the usage of Chinese modal auxiliaries of hedges are rare. It is shown that journals published in Chinese used fewer hedging devices than journals published in English.

It shows the functions and significance of pragmatics in the use of hedges. The hedges embodied the cooperative and polite principle and protected the writer or speaker's self-

reputations. Hedges help the academic journals more precisely and show up the discreteness of the writers. However, among the hedging strategies, modal auxiliary words are often underestimated and seldom used in academic writings, but they can mainly obscure accurate propositions appropriately to achieve the pragmatic effect of softening the tone of papers. Therefore, the modal auxiliaries as one of the hedging devices are worthwhile to study here.

2.3 Definitions of Modal auxiliaries

Varttala (1999) improved Hyland and other 'scholars' theories by considering the traditional grammar and then classified the use of hedges systemically. Modal auxiliaries always appeared in many sentences and articles to express researchers' semantic meaning and feelings. Modality is defined to convey expressions of how something might be and should be, including expressions of necessity, permissibility and probability. Modal auxiliaries are one of the most complicated grammatical structures in English. Nevertheless, it is considered that the definition of modal auxiliaries does not compromise the different linguistics groups these years (Torabiardakani et al., 2015).

For different linguistics groups, the definition of modality is controversial. Halliday (1970) stated that it is a method to let communicators intervene in the speech event and occupy the point of view. Not only that, Quirk et al. (1985) claimed that modality is how speakers determine the authenticity of the topic. In addition, according to (Huddleston & Pullum, 2002, p. 173), modality is specified as the speaker's judgments on the "necessity"and "possibility" of contents. Modal auxiliaries are served as verbs or other grammatical terms. Torabiardakani et al. (2015) stated that the modality has a significant semantic meaning. There are many definitions of modality earlier, which evidenced that modality had gained the scholar's attention in early times.

Modality is applied in a lot of situations, such as to express the possibilities and conciseness. In many research articles, modality plays a vital role to lighten the assertiveness in the papers. It is known that modal auxiliaries in English have different lexical forms and various functions in language use. Erton (2018) stated that modal auxiliaries should be taught their lexical meanings and their social pragmatic meanings and help learners learn it in semiotic environments. The scholar also added that the modal auxiliaries play an important role in research papers and especially have significant functions on 'learners' cognitions (Erton, 2018). The EFL learners should pay more attention to the pragmatic use of modal auxiliaries. He and Wang (2012) illustrated that one of the important types of modalities is the epistemic modality markers (EMMs) for hedges. "Epistemic modality markers" (EMMs) are the basic type of hedges expressing uncertainty and acting as a dominant. Modality here served as a basic strategy to hedge something.

Hacquard (2010) summarized the research about the modal auxiliaries that the modal auxiliaries are used to express the possibility/necessity in most situations, which sometimes results in lexical ambiguity. The scholar put forward an example in the English sentence, *"John may not watch TV, but he may be watching it anyway."* The most natural reading of this sentence is not contradictory and means that while John is not allowed to watch TV, it is possible, given what we know, that he still does. The first *"may"* express a deontic possibility (permission), the second: an epistemic possibility (what is possible given what is known). From the example, it is found that the modal auxiliaries express the meaning of the meanings themselves and the speaker's epistemic cognition. They serve as a word to express the possibility and the cognition beyond the semantic meanings. It is evidenced that the modal auxiliaries express the writers' or 'speakers' attitudes in many situations. The other scholars also defined the modals in early times. Kratzer (2013) classified the modals into two classes: epistemic and roots.

In modern times, Hacquard wrote that "Cross Linguistically, the same modal words can be used to express a wide range of interpretations. This linguistic trend supports a Kratzerian analysis. Each modal has a core lexical entry and where the difference between an epistemic and a root interpretation is contextually determined" (Hacquard, 2010).

Ismail Erton (2018) studied the difficulties in Teaching English modal auxiliaries to Turkish students and examined their communicative and pragmatic competencies as well. The partly results showed the different cultures and backgrounds led to the misunderstandings of communications. Therefore, the activities, assignments, tasks can help them learn pragmatically (Erton, 2018). The scholar also found that grammatically correctness is not the only key element to content understanding. The reason is that the modal auxiliaries in English have different lexical forms and different functions in pragmatic use. Also, in Turkish, and many other western languages, they used the suffix to distinguish the word. However, there are no suffixes in Chinese, resulting in Chinese auxiliaries being unable to be used, resulting in Chinese auxiliaries not being one-to-one correspondence to English auxiliaries. For the different language families, the expression is different. Therefore, people in different cultures cannot grasp the full pragmatic equivalence of modal auxiliaries (Erton, 2018).

2.4 Classification and function of modal auxiliary

Halliday et al. (2004) divided the modal verbs into three parts: high for expressing demand like must, ought to, medium for suggestion such as will, would, should, shall and low for permission such as may, might and can/could. Chinese have a different expression for modal auxiliaries but usually have the same meaning as the word in English. According to Feng and Yu (2007), based on Halliday's systemic functional grammar, the modal is one of the important language systems to achieve interpersonal functions.

The researchers found that the modals can be divided into two parts: epistemic modals and deontic modals. The epistemic models are the speaker's judgments to the proposition. Feng and Yu (2007) studied the frequency of modal auxiliaries in academic writings. Their studies found that whatever Chinese or foreign scholars used "may " is the most often, and "may" is more frequent than "might", even though they have the same semantic meanings more or less, but "might" is much lower frequency than "may".

Besides, "must" appear in the lowest frequency. Feng and Yu (2007) stated that the scholars should pay attention to the usage of might, because in academic writings, if the writers want to let their data and results be more reliable, they should use "might" very carefully   because in English, "might" has the weakest tone in expressing possibility. Feng and Yu (2007) established two corpuses, which are English scientific corpuses from English native scholars and Chinese scholars separately. The English native scholars used hedges more frequently than others based on statistics. The findings found that the Chinese scholars lacked confidence and were unwilling to do the assertion. They used less cognitive modal verbs, but more zero modal elements. The zero modal elements mean the sentence with the modality meanings but without modality elements. The sentence with this constituent often expresses the modality meanings of high values.

Cheng (2006) stated that it is difficult to tell a sentence without modality, which needs to consider the content carefully. It is known that in the specific content, the speaker's meaning is certain. When the speaker speaks out a sentence without modality, the opinions, they want to express either statements or zero modality opinions. However, if the listeners' understanding of content is different, the certain intention of the speaker that they think is different.

According to the classification, it is found that their meanings sometimes overlap with each other. Except for the lexical meaning, the choices of modal auxiliaries relate to epistemic cognition (Coates, 1983).

Due to the modal auxiliaries connected with epistemic cognition, the different thoughts lead to different choices of modal auxiliaries. Therefore, it is necessary to establish a standard for select modal auxiliaries used in academic writings. It is known that academic papers need to be scientific and vigorous, which means researchers should pay more attention to their main findings and the tune of the research, which will let the readers feel the writers' attitudes. And using suitable modal auxiliaries can enhance the speaker's reliability and the research.

Y. Zhao (1999) mentioned the three types of hedges, who thought the modal auxiliaries are part of the accuracy-oriented hedges. She also pointed out that the fuzziness and accuracy of language are contrary but rely on each other simultaneously. Even though the scientific discourse, the field acquired accuracy most, should adopt some proper modal auxiliaries to make them more concise. Y. Zhao (1999) divided the epistemic modals into accuracy-oriented hedges. Except for the accuracy of the content, these models, including modal auxiliaries, expressed the speaker or writer's hesitation and speculation.

For example, in English: They may not come. In Chinese, the sentence means "他们可能没来" here means the modal auxiliaries "可能" will express the speaker's speculation. The content is so important to the scholars' choices and the tune of articles.

2.4.1 Classification and function of Chinese modal auxiliary

In this part, the classification and function of Chinese modal auxiliary will be shown in the table to illustrate the previous studies and research.

Table 1.1 The classification of Chinese modal auxiliary

Name of Scholars	Proposed time	Classification
Coates	1983	Based on the semantic meanings
Yingling Z.	1999	Based on the degree of assertiveness
Cui	2003	Subjective modality Objective modality Incidental modality
Song	2009	Based on their characteristics: the possibility, willingness and necessity
Tong	2021	Based on their interpersonal communications

In the following text, the study would give examples to assist illustrating above table.

For the modal auxiliary's situations, Coates (1983) classified the modal auxiliaries according to their meanings, who is also the pioneer of the classification of the modal auxiliaries. Many Chinese and English scholars borrowed his concept as their studies basis. The scholar's classification is based on the semantic meaning of modal auxiliaries. For example, *"can"* mean permission; *"could"* mean the hypothesis; *"may"* means the epistemic possibility; *"might"* means epistemic possibility like *"may"*; *"must"* means strong obligation like *"shall"*; *"should"* means weak obligation and necessity; *"will"* implies volition and prediction; *"would"* means prediction and

hypothesis. Considering both the English and Chinese modal auxiliary classifications, we selected six Chinese example words, which reach the pragmatic and semantic equivalence between Chinese and English. They are *"会","可能","能","能够","可以","应该"*, and all of them include all the meanings of modal auxiliaries. Also, these morphemes are the most used in Chinese academic writings.

There isn't much Chinese literature that investigates the Chinese modality. The modal auxiliaries were mentioned by Yingling Z. (1999) as a hedging strategy to demonstrate the qualities of this method, consider the following examples of Chinese modal auxiliaries: Example 1*"发展中国家会越多进行技术复制与模仿..."* (It means the developing countries will copy and learn technology more and more.) The Chinese modal auxiliary *"会"* here is translated to *"will"* or *"can"*. So, this word expresses a prediction to the future, which lessens the assertiveness of the tone of the writer. Example 2: *"...又可维持天线的稳定性"* (It means can keep the stability of the antenna). At there, the Chinese modal auxiliary "可" at here can be translated to "can", and also can be translated to "could". Here, this word expresses an actual situation, but it avoids expressing it too frankly to make readers feel uncomfortable. Thus, the degree of assertiveness needs to be considered along with the content.

Cui (2003) believed that there are three kinds of modality in Chinese. They are subjective modality, objective modality and incidental modality. For the first group, subjective modality is equal to the epistemic modality in English, which is used to express the speaker's attitude to the authenticity or discourse content. Here is an example*"那个女孩在这个聚会玩的正开心呢!"* In English, the sentence means *("That girl must have fun at this party.")* This discourse is a subjective estimation from the speaker's view. For the second group, objective modality is the relevance between content of discourse and the external world. There are two types; realis

and irrealis, which are equals to the deontic in English. Here is an example *"你可以提交了!"* In English, the sentence means (*"You can submit now."*) This discourse expresses a permission of the speaker. For the third group, incidental modality is to express willingness, ability, possibility and necessity, which is like the dynamic modality in English. Here is an example *"这个数据可以被证实..."* In English, the sentence means ("the data could be evidenced.") The discourse here expresses a speculation.

The above groups distinguished the modality based on their pragmatics, and the other classification way is based on their characteristics. Song's study (2009), which classified the Chinese modal auxiliaries depending on their characteristics, including the possibility, willingness, and necessity. In possibility type, he took *"能" "可能" "会" "也许" "可以"* as examples; in willingness type, he took *"愿" "愿意" "肯" "要"* as examples; in necessity type, he took *"应该" "应当" "必须" "要" "得"*. He also added that differ from English, Chinese modal verbs can be used together in some context. For example *"他应该可能会来"* It is grammatically correct in Chinese but there is no use of "he may will come" in English. In Chinese, the modal verbs can appear in a sentence together but in English sentences, there can't be more than one modal verb in one sentence. Therefore, based on the characteristics of academic journals, they need to make the journals more precise and objective.

Song (2009) concluded that the realization of Chinese models is different from English, because it has their own modal particle and intonation. Such as *"他学过吧",* which means *("He might learnt it").* the morpheme *"吧"* here is a modal particle but cannot be translated in English straightly word by word.

Tong (2021) wrote that modality is the primary semantic carrier for interpersonal communications under the functional linguistic view, and modal verbs are the important part of the modality. But on the other hand, the modality helps to pass the speaker's position and attitude. According to Tong's research (2021), both foreign and Chinese writers favor the usage of modal verbs in a "low" field. In addition, the frequency with which modal verbs are utilized lowers as the modality position increases.

2.5 Modal auxiliaries in research articles

Liu et al. (2022) stated that the academic discourse aims to convey message and argumentation. It is for emphasize the reality and objectivity of the content and the accuracy and consistency of the logic. For the characteristics of the academic discourse, Liu et al. (2022) summarized that the academic discourse acquired the professional expression, logical expression, and objective expression and fixed writing style. For the above characteristics of the academic writings, it is necessary to think about how to realize them. Hardjanto (2016) found the scholar's attention to epistemic and root modality. Hardjanto's research focused on the major modal auxiliaries used as realizations of hedging in English academic discourse based on the previous study. His research results evidenced that the modal auxiliaries are essential to the academic discourse. The results evidenced that the frequency and distribution of modal auxiliaries in English academic discourse are varied in different disciplines. Also, the different modal auxiliaries have different usage frequencies.

Not only in English academic research, but Chinese scholars also studied the modal auxiliaries in Chinese academic research. For example, Wang (2018) did comparative analysis on the hedges in academic papers between English and Chinese. The researchers classified the English and Chinese hedges based on the Prince' theory and found out that the selected corpus of English used much more plausibility than the corpus of Chinese. However, the type of approximators is contrary (Wang, 2018). Ma

and Wang (2013) verified varttala's classification that the main function of modal auxiliaries is to lessen the writer's spoken ability. In the previous studies, Ma and Wang (2013) in the abstract of English academic journals, taking textile papers as examples, the modal auxiliaries verbs used most often as hedges. Hedges themselves are the means of expressing vague modalities, and modal auxiliary verbs can mainly obscure accurate propositions appropriately to achieve the pragmatic effect of softening the tone of papers. Zhou (2015) researched the characteristics of modal verbs in the Abstract part of the Chinese academic papers. Through Palmer's classification (2001), he classified the modality into three parts: epistemic, deontic and dynamitic modality. Zhou (2015) found that the Chinese scholars used deontic modality more frequently and less used the other two modalities. In Zhou's summary (2015), the writer found out there are many scholars studying the English abstract part in Chinese academic journals, who counted the modality's distribution of English abstracts of Chinese and foreign scientific and technological journals.

However, still few articles talk about the modality's distribution of Chinese abstracts of Chinese research articles. So here, the study is mainly research on it.

2.6 Chinese and foreign Scholars' preference of choosing the hedges in research articles

Wang (2021) found that the native English scholars use more hedges than Chinese scholars in their academic writings. And both two groups employ more approximators than shields based on the previous studies on hedges classification such as Prince et al. (1982). Besides, Wang (2021) identified that both Chinese and English scholars are likely to use more adaptors than rounders within approximators. In the shields, they both prefer to employ plausibility shields than attribution shields with the Shields. Wang (2021) proposed the appraisal theory to illustrate the scholar's preference in choosing the hedges. The writer mentioned the three interacting domains including

attitude, engagement and graduation. Based on Prince's theory that there are two categories of shields including plausibility shields and attribution shields. Among them, the plausibility involved the items like "may", "might", "could", which are used to show the speaker's attitudes and assumption directly. Wang (2021) summarized that the realization forms of shield can be analyzed as engagement resources. In the engagement resources the scholar continued to divide them into dialogic expansion and dialogic contraction, in which modal auxiliaries in the category of entertain of dialogic expansion. Throughout the data in the findings, Wang (2021) found that indeed both Chinese and English scholars enjoy high frequency in expansion resources mostly as modal auxiliaries. The writer also added that interpersonal meanings of modality are mainly realized by modal auxiliaries, modal adjuncts, modal attributes and certain mental verbs. In the modality, can/cannot, may, and should are the top three preferred modal auxiliaries for the Chinese scholars to express a sense of uncertainty or modesty. But for the English scholars, the top three preference in modal auxiliaries are may, can/cannot, might. It can be seen from the result that Chinese scholars preferred to use the words with more certainty.

However, the study didn't refer to the modality in different disciplines of research articles. It is believed that different disciplines used different modal auxiliaries as hedges. Also, the scholars in different disciplines and in different cultures have their own preference when they choose the modal auxiliaries as hedges in their articles.

2.7 Theoretical framework

The theoretical frameworks centered into the definition of Lakoff (1973) and Hyland (1998). The research studied the modal auxiliaries based on the hedge's classification by Varttal (1999), who proposed five types of modals, and Su's study (2002), who classified hedges in to eight groups and modal auxiliary in it. Therefore, the study chooses the modal auxiliaries as the research topic. According to Coates's *"The*

Semantics of the Modal Auxiliaries" (1983), and Song's study (2009) that both distinguished the Chinese modal auxiliary depends on their semantic and pragmatic functions, which were already explained in detail in the above part. Song (2009) also summarized that Chinese modal auxiliaries can be realized with the modal particle, intonation, modal verbs and auxiliaries, and noun. Instead of English modal auxiliaries, the Chinese modal auxiliary can be substitute by any adjunct words except the adjectives and can be used in conjunction.

Depending on the specialty of Chinese modal auxiliary and scholar's using preference in research articles. The study determined six Chinese represented modal auxiliaries depending on their semantic and pragmatic meanings rather than their parts of speech, to see their frequencies and distributions in the 40 research articles of four disciplines. Besides, the methodology and the findings of the research conclusion in Hardjanto, T. D.'s study are also the theoretical basis.

According to the previous studies, it is found that the Chinese research classified English semantic meanings highly influenced the English modal auxiliaries, and there are a few studies about the Chinese modal auxiliary. The main theories applied in this study are oriented by three theories of hedges classification. The first one is Coates' classifications, which classified the modal auxiliaries depending on their meanings. The book "*The semantics of the modal auxiliaries.*" Jennifer Coates in 1983 concerned the semantic meaning of the modal auxiliaries and listed them. They are *"MUST", "SHOULD", "OUGHT", "MAY", "MIGHT", "CAN", "COULD", "WOULD", "WILL", and "SHALL"*. The ten morphemes are the most often used morphemes in English. Considering the Chinese modal auxiliaries don't have clear semantic differences in some words. The study determined seven distinguished semantic meanings to consider at first, and they are *"will" "would" "might" "can" "could" "may" "should"*. These seven English morphemes are included in Coates' list. And the

second is proposed in Su's study (2002), who classified the hedges according to their word class, and among them, he proposed the modal auxiliary in Chinese. They are *"能、能够、可、可以、会、可能、应该、愿意、应当"* and so on. The third one is Song's study (2009), which classified the Chinese modal auxiliaries depending on their characteristics, including the possibility, willingness, and necessity. Other scholars like Wu (1999) identified the hedges' functions and meanings according to the corresponding hedge types in English and helped to choose the research materials of the Chinese modal auxiliary. Based on all the previous studies and considered the characteristics of Chinese modal auxiliaries as hedges that their semantic meanings cannot be isolated with the pragmatic meanings (Feng, 2006). Therefore, the study determines to select six representative Chinese modal auxiliaries hedges: "会" "可能" "能" "能够" "可以" "应该", these morphemes are most commonly appeared in Chinese academic writings and have corresponded meanings and functions in English modal auxiliaries. Also, they aroused many scholars' attention which is evidenced in the above classification ways.

Apart from that, the writer draws a flow chart to illustrate the theoretic framework visually. The following flow chart refers to flow chart 2.1. The author research the proposed research questions based on these theories. Through it, the author also analyzed the findings of the research. For this study, it focused on the modal auxiliaries as hedges and their frequency and distribution in research articles of different disciplines. Also, considering Salager-Meyer (1994) found the most severe hedging part was the Discussion part. The study determined to sum the appearing times of the six Chinese modal auxiliaries in the Discussion part in each article from different disciplines. Due to the frequency and distribution are not easily count, the research used T.D.'s calculation formula to do the research. The other point is well known that

Abstract part in an article is significant, so the study will also statistic the modal auxiliaries in this part and analyze their distributions in different disciplines.
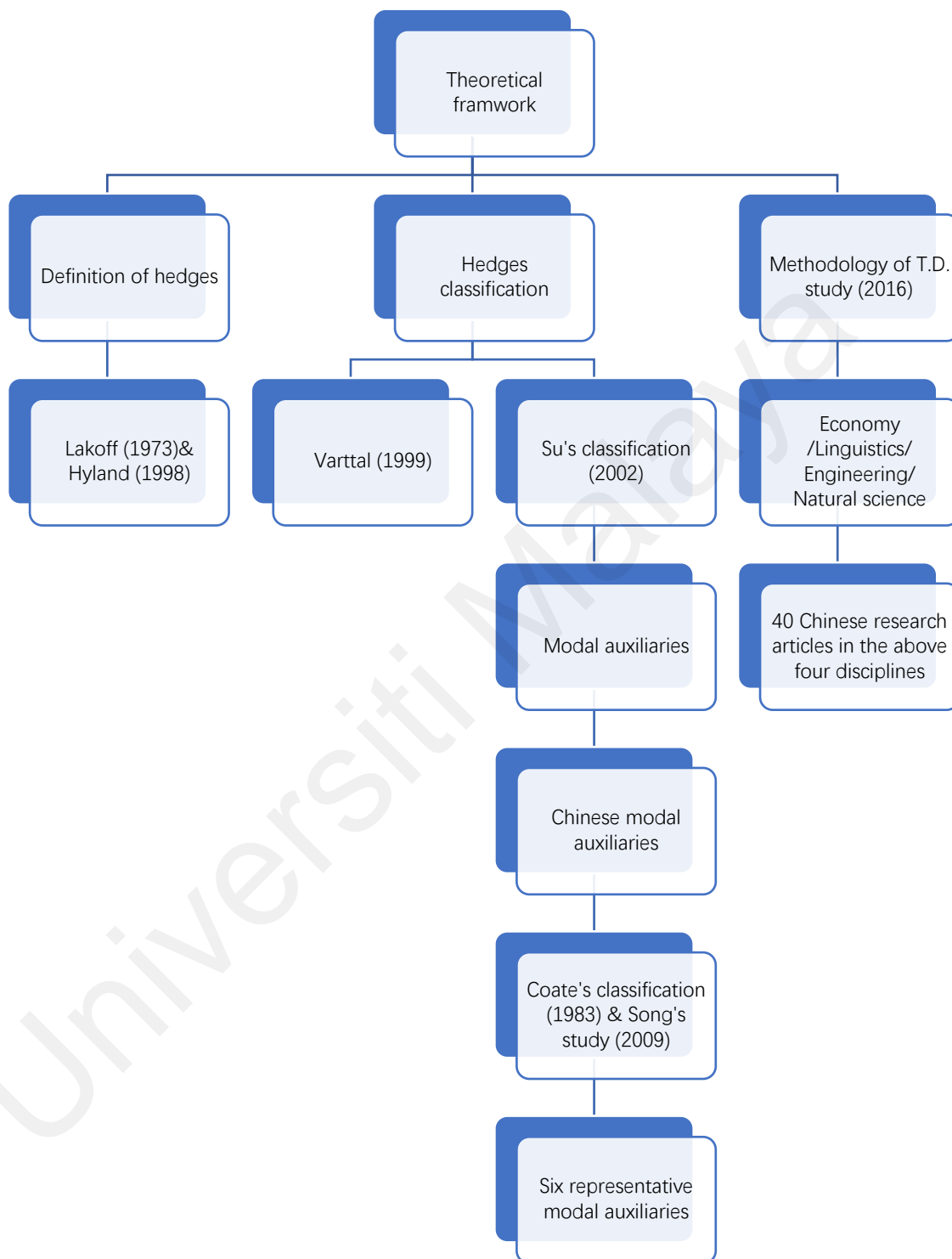
Flow chart 2. 1 Theoretical framework

2.7 Summary

Indeed, the chapter of Literature review discussed the previous studies on hedges definitions, hedges classifications, and modal auxiliaries as one of hedging strategies used in research articles. Depending on the previous studies, the chapter concluded the earlier research on modal auxiliaries as hedges in research articles. Regarding the research questions of this study, the chapter provided solid theories and research findings to support the further research.

CHAPTER 3: METHODOLOGY

3.0 Introduction

This chapter discusses the research design, research methods, data collection and detailed procedures to help readers understand the methodology of this study completely. Based on Coates's classification (1983) and Song's study (2009), the study picked the most often modal auxiliaries in Chinese. The research selected six representative Chinese modal auxiliaries hedges: "会" "可能" "能" "能够" "可以" "应该", these morphemes are most commonly used in Chinese academic writings. In English, their semantic meanings are equal to the *"will" "might/may" "can" "could" "would" "should"*. The first task counts the six Chinese modal 'auxiliaries' appearing times and calculates their frequency in the discussion parts of the corresponding disciplines. The second task is to summarize the frequency and distribution of the six modal auxiliaries in Abstract parts. The third task is to answer the four research questions. And the last task is to discuss the research answers and findings and try to provide an insight for choosing suitable modal auxiliaries as hedges in different disciplines for Chinese scholars.

This is a task-based analysis. The research adopted mixed method research which combined the quantitative analysis with qualitative analysis.

3.1 Methodology background

This part is to give a background of research methodology. The research selected 40 empirical research articles from 4 disciplines at random. The study downloaded all the articles from CNKI (China National Knowledge Infrastructure-searching engine). The chosen articles were published from 2020 to 2021 to ensure effectiveness and are forward-looking. According to the keywords of "economy, linguistic, engineering and natural science", the study searches the corresponding disciplinary articles. After choosing the 40 articles, the study transferred all the pdf versions to the text version,

which used AntFile Converter. Next, the writer tagged the six Chinese main modal auxiliaries of hedges *"会""可能""能""能够""可以""应该"*in their word classes, and identified their common roles as modal auxiliaries. Then, the study used AntConc to lead each article in it and search the six Chinese main modal auxiliaries of hedges. After that, the study counts the number of times that they appeared in each article separately. In case of avoiding mistakes, the study counts the appearing times of the six hedges manually as well for sure. After that, the study locates the six modal auxiliaries appearing in each article and calculates their frequencies. The author explained the concrete analyzed steps in the research procedure part. All the data illustrated by the tables to show the results visually.

3.2 Research design

For illustrating the modal auxiliaries' frequency and distribution in Chinese research articles and discussing their functions and pragmatic use. The studying materials from Chinese scholarly journals took linguistics, natural sciences, economics and engineering as disciplinary examples. Also, many Chinese researchers study the abstract parts, and the abstract part is the most crucial part of the paper, which presents the main tune of the article. The four disciplinary examples choices are based on the study by Hardjanto (2016), focused on the modal auxiliaries on English research. They are universal disciplines and conclude the different kinds of science.

3.3 Data selection

The study selected 40 discussion and abstract parts for the mentioned above. The research chose 10 articles from economy, 10 from linguistics, 10 from natural science, and 10 from engineering. All the fields belong to different disciplines. These empirical research articles should be published from 2020 to 2021. All the articles are selected from Chinese leading journals in CNKI (China National Knowledge Infrastructure-searching engine). To ensure the authority of data and research, the

journals are regarded as the core domestic journals of various disciplines and published in 2020~2021 to show the timeliness of the research.

The study chose 40 research articles in contrast with other articles, which set the similar research ae well. Too many articles are too difficult to count and estimate, and fewer articles are too minor to get the objective and useful results. Compared to other experiments, most researchers choose to control the variable and fix the dependent variable. The author chooses 10 articles for each discipline in this study. In this way, the study can calculate the frequency and distribution easily and comparatively. As for the choices of disciplines, the four disciplines are separated and distinctive to each other. And the four disciplines are representative of the basic fields. Besides, the top 10 articles changed whenever you entered the CNKI website, so the study chose the top 10 articles that appeared for the first time on May 1st in 2021. This regulation is applied in all four disciplines. Here is flow chart 3.1 to show the data collection procedure that how to pick 10 articles in each discipline (taking economy as example).
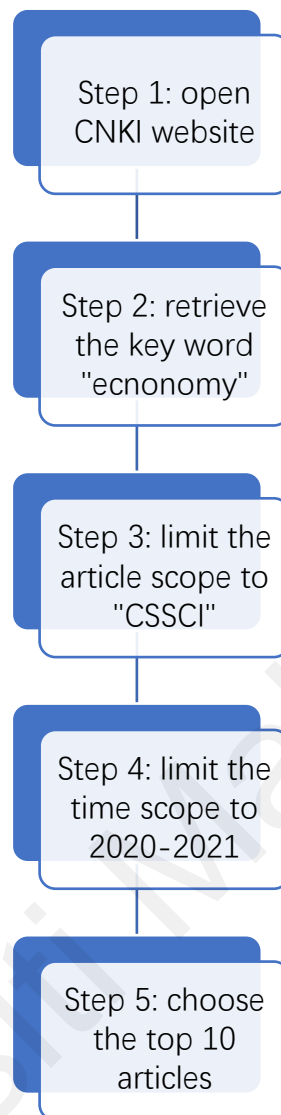
Flow chart 3.1: The flow chart of picking materials

As it shown above, the other thirty articles from the other three disciplines are followed this flow chart. All the forty articles are selected and received in the files.

3.3 Research procedure

Due to the study based on Hardjanto, T. D. (2016)'s study, the research procedure is like that study. Here is the data processing of the research. The research procedures are shown as a flow chart and words. The flow chart 3.2 showed how to process the data.

```
┌─────────────────────┐
│ Step 1: Input 10    │
│ articles (pdf) to   │
│ ANtFileConverter to │
│ get their text      │
│ verisons            │
└─────────────────────┘
          │
┌─────────────────────┐
│ Step 2: Input 10    │
│ articles in text    │
│ version to          │
│ EncodeAnt, and get  │
│ utf8 versions       │
└─────────────────────┘
          │
┌─────────────────────┐
│ Step 3: Get the 10  │
│ articles in utf8    │
│ version and put     │
│ them into           │
└─────────────────────┘
          │
┌─────────────────────┐
│ Step 4: Get the     │
│ segment articles    │
│ then put into       │
│ AntConc             │
└─────────────────────┘
          │
┌─────────────────────┐
│ Step 5: Open them in│
│ AntConc and retrieve│
│ the six Chinese     │
│ modal auxiliaries   │
│ separately          │
└─────────────────────┘
          │
┌─────────────────────┐
│ Step 6: Sum up the  │
│ appearing times of  │
│ six modal           │
│ auxiliaries of      │
│ each article        │
└─────────────────────┘
```

Flow chart 3.2: Data processing procedures

Now, the data has already been processed. The following content will identify the concrete procedures which used to deal with the data and answered research questions.

Before answering the research questions, the study would tag the six modal auxiliaries and evidenced that all of them belong to modal auxiliaries even some of them served as other grammatical functions such as verbs, adverbs and so on.

Firstly, Considering the first research question is "What are the frequency and distribution of the Chinese modal auxiliaries in the journal articles from the four main branches of the discipline?". The procedures to answering the question is count the appearing times of the six modal auxiliaries of each article separately at first; then sum each modal auxiliaries' appearance in the same disciplines of the ten articles. Thus, we would get the number of the times and take them into T.D.' s formula "Normalised frequency= Frequency (count of modal auxiliaries) *10,000/Word count" and get a coefficient to compare. Last, we would get the frequency and distribution of the Chinese modal auxiliaries in the different disciplines, and the frequency and distribution of the six different modal auxiliaries in the articles of the same disciplines.

Moving to the second question "What are the frequency and distribution of the Chinese modal auxiliaries in the abstract parts of the journal articles from the four main branches of the disciplines?". This question can be answered with the above steps as well. The only difference is that we need to intercept the abstracts of the articles as materials and see the six represented modal auxiliaries' frequency and distribution. The further analysis can be considered to discuss with question one, because abstracts is considered as the most important part in the overall articles. To some degree, it represents the main tone of the article, and the modal auxiliaries has influence on the tone of the article in some way exactly.

The third question is "What are the conditions that enable Chinese modal auxiliary words to achieve semantic equivalence with English?". To answer this question, we would take Coate's classification (1983), who proposed morphemes *"MUST", "SHOULD", "OUGHT", "MAY", "MIGHT", "CAN", "COULD", "WOULD",*

"WILL", and "SHALL" as the list. If the study wants to examine the conditions that enable the two languages achieving semantic equivalence. The only way is to use number of examples to discuss this situation. Therefore, the question three needs to be investigated by exemplified analysis, and summary the commonness character as the answers.

The last question is "What are the preference when the Chinese scholars selecting the Chinese modal auxiliaries in the journal articles from the four main branches of the discipline?". Here, the study used Wang (2021)'s appraisal theory as reference. The procedure to answer this question is also rely on the examples. According to Wang (2021), modal auxiliaries are preferred by both Chinese and English scholars, and Chinese scholars preferred the modal auxiliaries with more certainty. The study picks out the results of the first question, and then find out the top three modal auxiliaries in each discipline. Later, to discuss whether there is a similarity or difference among them. Furthermore, the study would try to discuss why the consequence comes out.

For the actual results and analysis would be shown in Chapter four.

3.4 Summary

In summary, the study adopted mixed method research which combined the quantitative analysis with qualitative analysis. Modal auxiliaries served as one of the hedging strategies cannot be investigated isolated by semantic or pragmatic. Therefore, the study also adopts the diachronic method, comparative method and the example method to assisting investigate the Chinese modal auxiliaries in the research articles. The study applied diachronic method to summary the classification of the Chinese modal auxiliaries' development and analyze the modal auxiliary as hedges from the appropriate classification. The study also applied the comparative and example methods to answer the third and fourth question. The two questions relied heavily on the

previous studies, existed research and subjective thoughts, so the study compared and

illustrated examples to analyze and proof the findings.

CHAPTER 4: RESULTS AND FINDINGS

4.0 Introduction

This chapter is to show the results and findings of this study. The results and findings are used to answer and discuss the four research questions. For data analysis, the results will divide into two parts: the results and findings of the frequency and distribution on modal auxiliaries of overall articles in different disciplines, and the results and findings of the frequency and distribution on Chinese modal auxiliaries of the Abstracts parts in different disciplines; the discussions of the four research questions related to the frequency and distribution of Chinese modal auxiliaries in different disciplines, semantic equivalence between Chinese and English, and the Chinese scholar's preference on choosing suitable modal auxiliaries. All the results and discussions rounded the four research questions and the data shown in tables.

4.1 Overall review of the data

This part briefly showed the results of the Overall hits of six modal auxiliaries appeared in forty articles, and the hits of different types of Chinese modal auxiliaries appeared in the four disciplines. There are 834 hits of the six modal auxiliaries in the forty articles in total. The Table 4.1 showed that there are 263 hits of "会", 163 hit of "可以", 147 hits of "能够", 138 hits of "能", 105 hits of "可能", 18 hits of "应该". The top three are "会" "可以" "能够", which appeared most often in the 40 articles.

Among the four disciplines, the 10 articles from discipline of economy used 546 times of modal auxiliaries, and the 10 articles from discipline of engineering used 88 times of modal auxiliaries; the 10 articles from linguistic area appeared 138 times of modal auxiliaries, and the 10 articles from natural science area appeared only 68 times of modal auxiliaries. It is shown in Table 4.2. To sum up, it is found that these modal auxiliaries in Chinese research articles are most frequently used in discipline of economy, and least frequently used in discipline of natural science.
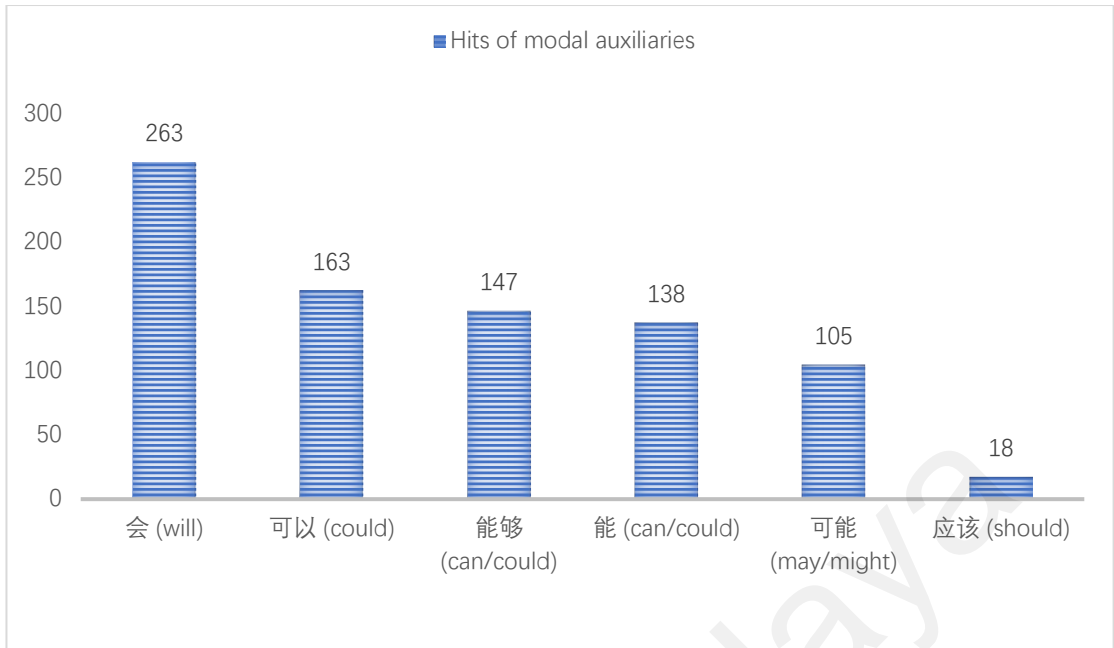
Figure 4.1: Overall hits of six modal auxiliaries appeared in forty articles
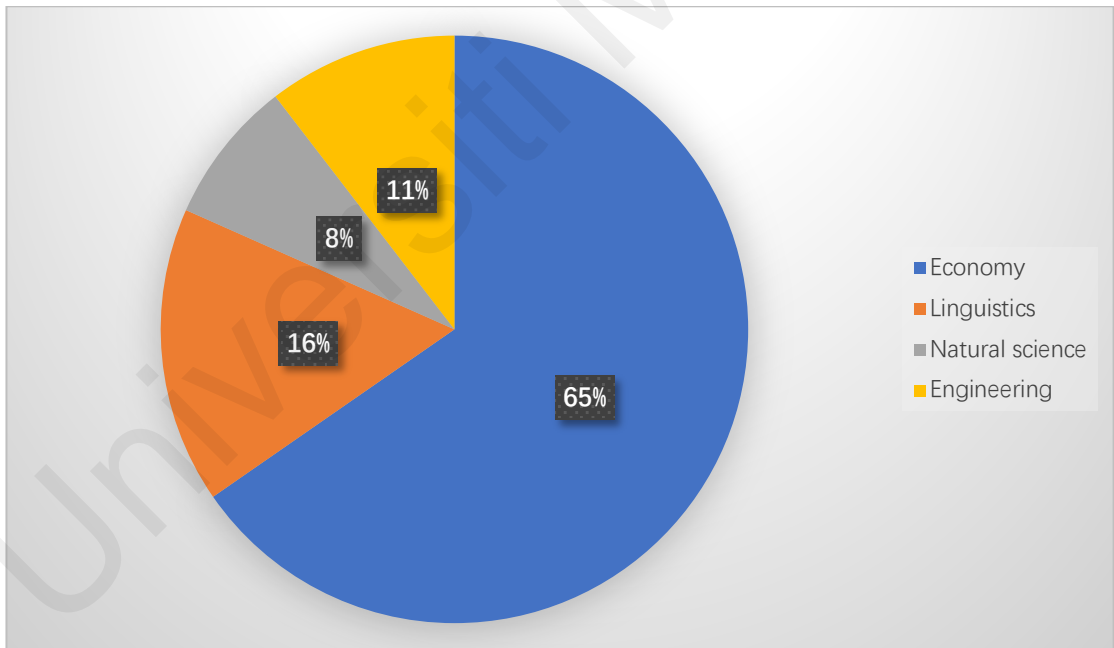
Figure 4.2: Different types of Chinese modal auxiliaries appeared in the four disciplines
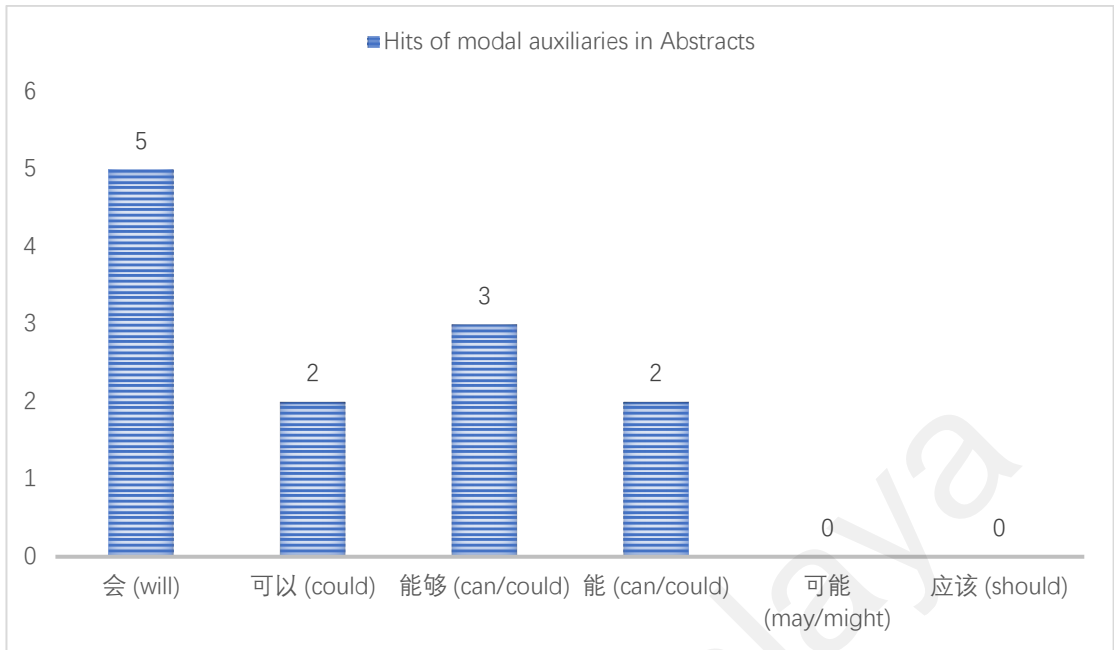
Figure 4.3: Different types of Chinese modal auxiliaries appeared in the four disciplines in the abstract part
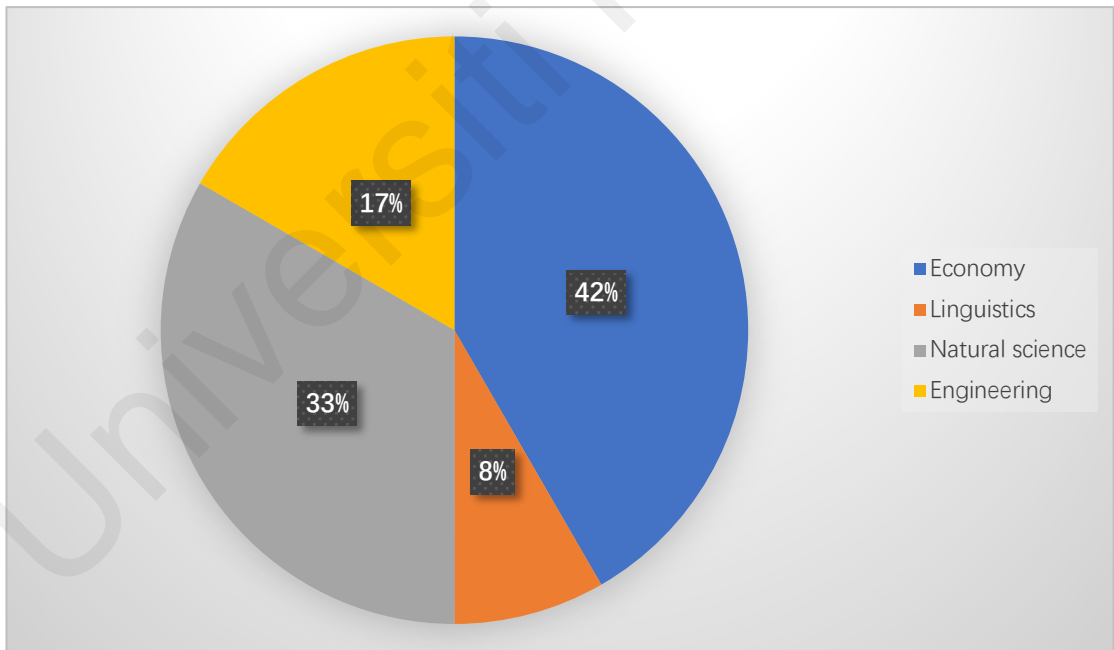
Figure 4.4: Chinese modal auxiliaries appeared in the abstracts of the four disciplines

The Table 4.3 and Table 4.4 showed the six modal auxiliaries appeared in the abstracts. The modal auxiliaries occupied a very small part of the modal auxiliaries compared with them appeared in all overall articles. Also, "可能" and "应该" are not appeared in

the Abstracts. Besides, in the disciplines, Economy and Natural science used more modal auxiliaries in their Abstract parts.

4.2 Results and analysis

This part answered four research questions according to the data results. In this part, the data are analyzed in detail.

4.2.1 Analysis of the first research question: What is the frequency and distribution of the Chinese modal auxiliaries in the journal articles from the four main branches of the disciplines?

T.D.'s study (2016) found out in English research articles, the modal auxiliaries are most frequently used in Linguistics and least frequently used in Natural science. According to the Table 4.2, it is evidenced that in Chinese research articles, the Chinese modal auxiliaries are most distributed in economy and least distributed in Natural science. Thereinto, the modal auxiliaries in the disciplines of economy occupied more than fifty precents. However, we are not examining their frequencies in different disciplines. For seeing the frequency of the modal auxiliaries in Chinese research articles, the study adopted the T.D.'s formula to calculate their coefficients. Here is the concrete analysis.

For the discipline of economy, the author selected top 10 research articles that followed the above flow steps and used the Ant Conc to count the appeared times of the six Chinese hedges in the total 10 articles. In economy, the results are: "会" appeared 176 times; "可能" appeared 61 times; "能" appeared 97 times; "能够" appeared 90 times; "可以" appeared 108 times; "应该" appeared 12 times. The study labeled the 10 articles in the economy field from one to ten, and for convenience, and we labeled them A1 to A10. The factual data is shown in table 4.5 following.

Table 4.1: The distribution and frequency of modal auxiliaries in each article in economy

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
会 (will)	33	12	52	10	9	24	16	2	9	9
可以 (could)	8	12	1	9	3	5	12	21	12	21
能够 (can/could)	6	21	0	29	3	3	1	6	6	9
能 (can/could)	40	4	0	15	4	7	12	21	12	2
可能 (may/might)	9	0	3	5	5	7	12	2	9	5
应该 (should)	6	0	0	2	0	2	0	0	1	1
Frequency	40.01	72.05	50.76	72.95	33.98	42.32	39.95	25.58	36.13	38.22

Accrding to the formula, normalized frequency= frequency (counts of six modal auxiliaries) *10,000/Word, so the normalized frequency of each article in the economy is. When the coefficient is higher, the frequency is higher. In the economy field, the 40.01; 72.05; 50.76; 72.95; 33.98; 42.32; 39.95; 25.68; 36. 13; 38.22. The higher the coefficient is, the higher frequency of the modal auxiliaries. The frequency of modal auxiliaries in each article is illustrated in the table, and the average coefficient is 45.21 in the economy discipline.

Based on the data, it is found that Article 8 has the least frequency. Furthermore, it is found that the methodology of article A8 is a mixture of quantitative and qualitative analysis, and more concentrate on the data analysis.

For the discipline of linguistics, the author selected top 10 research articles that followed the above flow steps and used the Ant Conc to count the appeared times of the six Chinese hedges in the total 10 articles. the study labeled the 10 articles in the linguistic field from 11 to 20, and for convenience, we labeled them A11 to A20. In Linguistics, "会" appeared 43 times; "可能" appeared 31 times; "能" appeared 12 times; "能够" appeared 14 times; "可以" appeared 30 times; "应该" appeared 5 times. Table 4.6 has shown the results.

Table 4.2: The distribution and frequency of modal auxiliaries in each article in linguistics

	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20
会 (will)	27	2	12	2	0	0	0	0	0	0
可以 (could)	18	6	4	2	0	0	0	0	0	0
能够 (can/could)	9	0	2	1	2	0	0	0	0	0
能 (can/could)	3	1	7	0	0	0	0	0	0	0
可能 (may/might)	9	2	12	2	0	0	0	0	0	0
应该 (should)	1	3	1	0	0	0	0	0	0	0
Frequency	42.86	15.24	32.92	11.62	9.80	0	0	0	0	0

The average coefficient in Linguistics is 11.24. Comparing the average coefficient between the discipline of economy and linguistics, it is found that the coefficient of economy is higher, which means it represents the higher frequency in discipline of economy for research papers. It is also found that the modal auxiliaries concentrated on the specific papers both in discipline of economy and linguistics.

For the discipline of Natural science, the author selected top 10 research articles that followed the above flow steps and used the Ant Conc to count the appeared times of the

six Chinese hedges in the total 10 articles. the study labeled the 10 articles in the Natural science field from 21 to 30, and for convenience, we labeled them A21 to A30. "会" appeared 9 times; "可能" appeared 16 times; "能" appeared 16 times; "能够" appeared 9 times; "可以" appeared 25 times; "应该" appeared 1 times. Table 4.7 has shown the results.

Table 4.3: The distribution and frequency of modal auxiliaries in each article in natural science

	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30
会 (will)	0	0	0	0	6	0	3	0	0	0
可以 (could)	0	0	0	0	8	0	15	0	0	2
能够 (can/could)	0	0	0	0	2	0	7	0	0	0
能 (can/could)	0	0	0	0	13	0	3	0	0	0
可能 (may/might)	0	0	0	0	1	0	15	0	0	0
应该 (should)	0	0	0	0	0	0	1	0	0	0
Frequency	0	0	0	0	41.48	0	48.33	0	0	3.01

From the frequency of each article, we get the average coefficient in Natural science. It is 9.28. Surprisingly, the coefficient compared with Linguistics is not different too much. It might indicate that the modal auxiliaries use is not really related to difference of the Arts and Science. From the table, it also can be seen that A25 and A27 have high frequency compared with the other articles of Natural science. Both two articles are used words to explain the related theories and effect. The words are more vivid and concrete, but the other articles used formula and numbers more than words, and too abstract to understand for the outsiders.

For the discipline of Engineering, the author selected top 10 research articles that followed the above flow steps and used the Ant Conc to count the appeared times of the six Chinese hedges in the total 10 articles. the study labeled the 10 articles in the Natural science field from 31 to 40, and for convenience, we labeled them A31 to A40. In Engineering, "会" appeared 33 times; "可能" appeared 0 times; "能" appeared 15 times; "能够" appeared 32 times; "可以" appeared 0 times; "应该" appeared 0 times. Table 4.8 has shown the results.

Table 4.4: The distribution and frequency of modal auxiliaries in each article in engineering

	A31	A32	A33	A34	A35	A36	A37	A38	A39	A40
会 (will)	2	4	3	0	0	4	4	0	14	2
可以 (could)	0	0	0	0	0	0	0	0	0	0
能够 (can/could)	0	1	3	2	1	0	2	20	0	3
能 (can/could)	1	0	3	1	3	1	2	1	1	2
可能 (may/might)	0	0	0	0	0	0	0	0	0	0
应该 (should)	0	0	0	0	0	0	0	0	0	0
Frequency	2.86	5.70	9.61	3.37	4.44	3.85	7.67	20.96	19.18	3.76

Here we can get the average coefficient is 8.14. A38 and A39 is in high frequency. Considering that A39 used quantitative method to analyze, so in the discipline of Engineering, the influence of the method is small. It more connected scholars' personal styles and thoughts.

For the above four tables on the distribution and frequency of six modal auxiliaries in four distinguished disciplines, the study summarized the average coefficients and found

out that they are 8.14 in Engineering, 9.28 in Natural science, 11.24 in Linguistics, and 37.37 in Economy. For the first three disciplines, they are close enough. We can be judged that the modal auxiliaries are most frequently appeared in the discipline of Economy, and least frequently used in the discipline of Engineering but close enough with the disciplines of Natural science and Linguistics. What's more, it is found the methodology of the selected articles has effect on their hedges uses. Most of the articles used qualitative analysis or mixed analysis inclined to use more modal auxiliaries in their articles. But for the articles only applied quantitative analysis may secund to write their articles without modal auxiliaries, because they want to explain by the data.

4.2.2 Analysis of the second research question: What are the frequency and distribution of the Chinese modal auxiliaries in the abstract parts of the journal articles from the four main branches of the disciplines?

For analyzing the Chinese modal auxiliaries appeared in the four disciplines in the Abstract part is vital for seeing the tone of the articles. As we know that the Abstract part is the profile of the overall article, thus the importance is self-evidenced. In the chapter of literature review, the study has already showed that there are many articles talked about the abstracts in English. However, most of them focused on the English abstract of the articles instead of the abstract in national Chinese language, which may convey and disclose more attitudes about their articles.

Among them, modal auxiliaries served as the tool to help to fulfill the articles. For this purpose, it is necessary to analyze their distribution and frequency in the abstract parts of the journal articles from the four main branches of the disciplines. The Table 4.9 has shown the concrete situation.
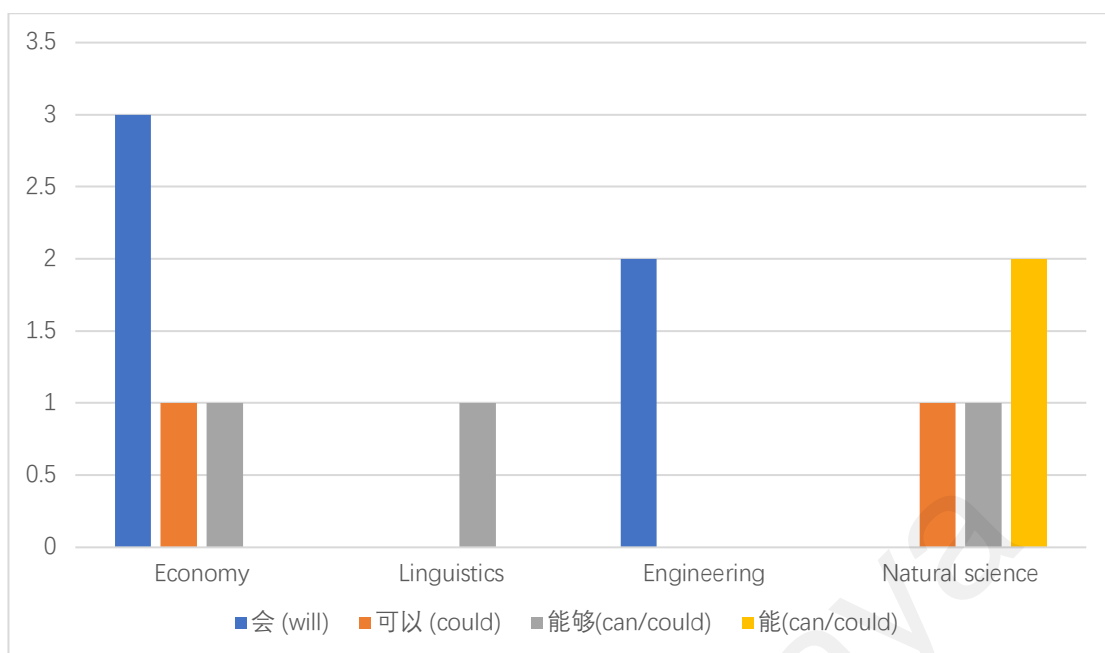
Figure 4.5: Different types of Chinese modal auxiliaries appeared in the four disciplines in the abstract part

In Table 4.9, we count the modal auxiliaries that appeared in the Abstract part. The modal auxiliaries occupied a very small part of the modal auxiliaries that appeared in all overall articles.

We calculated the proportion of the modal auxiliaries in the Abstract part, which occupied the overall modal auxiliaries. We found that in the discipline of economy, the proportion of modal auxiliaries in the abstract part is 1.2%. In the discipline of linguistics, the proportion of modal auxiliaries in the abstract part is 0.7%. In the discipline of engineering, the proportion of modal auxiliaries in the abstract part is 2.3%. In the discipline of natural science, the proportion of modal auxiliaries in the abstract part is 5.9%.

All the modal auxiliaries in Abstracts are mainly for expressing prediction and completed conclusion. Basically, the entire abstract is the finished state, for example *"...了" "实现了" "完成了" "建立了"* in Chinese, this kind of form means completion. Abstract acquired to write objective and briefly, so the modality hedges used very little. In the Abstract part, most of the scholars mainly used the degree of change like *"不仅*

如此";"而且";"进而" (which means *moreover, what's more and not only)*. The hedges in the Abstract part served as the connection function with actual meanings in the most situations. Besides, most of the modal auxiliaries as hedges in the Abstract part are used to express the prediction, permission and hypothesis as same as the modal auxiliaries used in the overall articles. We can see from the data, *"会""可以""能够" "能"* are the most frequent words in Abstracts as same as them in overall articles.

To sum up, the Chinese modal auxiliaries in Abstracts are not the main theme compared with other hedges. However, it still reflects the objectivity and main tone of the articles. There are few differences between the disciplines for using the modal auxiliaries.

4.2.3 Analysis of the third research question: What are the conditions that enable Chinese modal auxiliary words to achieve semantic equivalence with English?

From the above analysis, we already showed and analyzed the different disciplines used different modal auxiliaries in different frequencies and distributions. However, we found that there are two or three Chinese modal auxiliaries have a same semantic meaning in English, such as *"会""可以""能够""能"*, which are understand equally with the meaning of "can/could" in English. A question raised that why they have similar semantic meanings, but scholars used them in different frequencies. To answer this question, we need to analyze the six Chinese modal auxiliaries *"会""可能""能""能够""可以""应该"* one by one.

The first three similar words are *"可以""能够""能"* in Chinese are similar to *"can/could"* in English, it is difficult to say the semantic differences between the three Chinese words, especially to the foreign readers. From the data, the total hits of *"能够"* and *"可以"* are in a close frequency but far more than the hits of *"能"*. For the other three disciplines, the two of hedges used a nearly frequency except *"可以"* in natural science are used most frequent, the study examined the materials and articles and found

that *"可以"* mainly used in A27, it is found that "可以" always used behind an existing theories to show the strong possibility that the theories can be verified. Taking one of examples here, a fragment from A27, *"罗巴切夫斯基详细阐述了泛几何的基本假设，从中可以总结出其建立泛几何的关键思想"* (*Loba outlines in detail the basic anatomy of geometry that can delineate the key ideas of its construction flood*). We can see that *"可以"* here is to help to ensure the verification's possibility. Instead, *"能够"* and *"能"* are always appeared behind the personal pronouns. The fragments in A27 included *"早在1799年，拉普拉斯就能够在给定参考系下描述出一般的力学"* (*As early as 1799, Laplace was able to describe general mechanics in a given frame of reference*) *"我们能够获得一些新的信息…"* (*We were able to get some new information…*) *"其数学内容也被充分地解读，由此我们能清晰地看到"* (*Its mathematical content is also fully interpreted, from which we can clearly see*). The English version was translated by the Google translator and grammar corrected by the author. It is seen that *"可以"* and *"能够"* translated to achieving the same semantic meaning in most of situations if without scholars and context's consideration, which is "be able to". And *"能"* was translated to "can" mostly if without consideration of scholars' preference and context. *"can" "could" "be able to",* all of them has different emphasis "can" emphasized the self-capability and "be able to" emphasized the results which make many efforts on it; "could" is similar with "can" to emphasize the self-capability also but is not necessarily succeed. If Chinese modal auxiliary words want to achieve semantic equivalence with English, the most important thing is to identify the minor differences.

"可能" in Chinese are similar to *"may"* and *"might"* in English, "*可能*" in Chinese is uncertainty, people always say that when they want to express a guess which has low possibility to come true. The speakers do not know about the proposition when they use

"可能". Also, the modal auxiliary may appear in the sentence that speakers are unsure about the situation or unwilling to act on the proposition. Taking a sentence for example,"这个研究结果可能存在..." That means, ("The results of the study may/might exist"). The Chinese sentence expressed a reasonable possibility. But if we see might in English, taking this English version of the sentence for example. This sentence showed much less possibility that the original text wants to convey, because *"might"* in English represents the lowest possibility to some degree. This is an interesting phenomenon that we cannot reach a complete semantic equivalence between two different languages. From the limited data, it can be found that the scholars prefer to adopt "可能" to express the epistemic possibility in the academic writings except engineering field. In the 10 articles from engineering fields, *"可能"* have not occurred. Calculating all the hit of *"可能"*, it is found that the number is small here, so the modal auxiliary are not preferred by the scholars especially for Engineering field. For achieving the semantic equivalence, "might" is not the first choice when the scholars want to predict the low possibility. Like Feng and Yu (2007) studied the frequency of modal auxiliaries in academic writings. Their studies found that whatever Chinese or foreign scholars used "may " is the most often, and "may" is more frequent than "might". Therefore, the findings showed that if *"可能"* want to achieve semantic equivalence with English, it would better to adopt "may" instead of "might".

In all six modal auxiliaries, *"会"* occupied the biggest part. For *"会"*, it occupied most part of the six modal auxiliaries. We took A3 in Economy which *"会"* appeared most frequent to illustrate the examples *"分工的发展会形成..."(The development of division of labor will form...)* *"这种风险分担行为会进一步扩大网络规模" (This risk-sharing behavior will further expand the scale of the network...)* "网络的负效应会

使得个体风险在网络链条上迅速传染" (*The negative effect of the network will make individual risks spread rapidly in the network chain...*) "交易协调成本的不断提高会使得分工网络受到协调可靠性的制约" (*The continuous increase of transaction coordination cost will make the labor division network restricted by the coordination reliability.*) "制度信息的不对称会愈演愈烈" (*The asymmetry of institutional information will intensify*) Basically, it is believed that the Chinese modal auxiliary "会" always be translated to "will" in most situations, which is used to predict a trend or do the explanation for the conclusion. It is also found that the modal auxiliary helped to do the explanation is more than the modal auxiliary helped to do the prediction. However, according to Wang's study (2021), the top three preferred modal auxiliaries for the Chinese scholars to express a sense of uncertainty or modesty in English are *"can/cannot" "may" and "should"*. But it is found that even though "会" appeared most frequent in Chinese research articles, it often omitted when they translated it to English.

The last one is "应该", which is also the least frequent word among the six modal auxiliaries. "应该" only appeared 11 times in overall articles, and thereinto, 3 times appeared in A12. The three script are all selected here to analyze *网络媒介的功能应该被重新审视...*" (*The functionality of the network should be resolved...*) "群域话语研究应该重新审视人类意识形态与技术之间的关系" (*Group domain discourse research should re-examine the relationship between human ideology and technology*) "因此系统功能语言学对多模态话语的分层理论应该有用武之地" (*Therefore, systemic functional linguistics should be useful for the hierarchical theory of multimodal discourse*). From the above examples, it is obvious that no more English word can achieve semantic equivalence with "应该" so adequately except "should". "应该" in most situations are expressing scholars' opinions subjectively. So far, we already

discussed that how the six representative Chinese modal auxiliary words to achieve semantic equivalence with English separately.

In a word, it depends heavily on the minor differences between Chinese and English synonyms in different context, and scholars' conventions of language habits. Based on the above data and analysis, it is found that the pure semantic equivalence between English and Chinese isn't appearing. If we want to achieve semantic equality between the two languages, we need to consider the content of the journals.

4.2.4 Analysis of the fourth research question: Why Chinese scholars frequently use these Chinese modal auxiliaries in the journal articles from the four main branches of the discipline?

Here, the study will analyze why the scholars in different disciplines have different preference when they select the suitable modal auxiliaries in their works. It will be analyzed in internal and external elements. Firstly, to concentrate on the top three modal auxiliaries in the discipline of Economy, Linguistics, Natural science, and Engineering. The data shown as follows:

In the discipline of Economy, *"会"* occupied 33.8% in overall modal auxiliaries. Considering the "会" appeared in Economy, the study analyzed some examples in the third question, and we found out that in the discipline of Economy, the scholars are more likely to do the prediction. That's why *"会"* appeared much more frequent than the word in other disciplines.

It may relate to the characteristics of the discipline of economy as well. The articles in this discipline always help to predict the economic situations and or explain the economic theories. Unlike other disciplines, economy cannot be studied only by data or formulas, and cannot be summarized and analyzed only by the abstract theories. Economy is changed at any moment according to human's activities. Therefore, we can

predict the trend, but cannot get the conclusion doubtlessly. For the other two modal auxiliaries *"可以" "能"*, which two help to explain the abstract economic theories.

In summary, we found out that in the discipline of economy, the scholars are likely to use "会". The first internal reason is considered the modal auxiliary's implication that can be used to show the prediction, and for the second reason is considered that the discipline's characteristics, which means economy cannot be determined and concluded by any single research, so the scholars are bolder to make comments. For the third reason is most of the economic articles applied qualitative analysis as their methods. For the external reasons, there is scholar's preference and articles' style influenced on the modal auxiliaries uses. For example, *"实际控制权可能会由经理转向债权人" (De facto control may shift from managers to creditors)* the Chinese scholars use two modal auxiliaries at a time, which will not happen in English. We can see here *"可能会"* is translated to *"may"*, because it against the rule of English grammar if they translated straightly. The situation sometimes happened in the research articles, which result in the hits of "会" increased, but it only appeared 4 times in the 10 articles from discipline of economy.
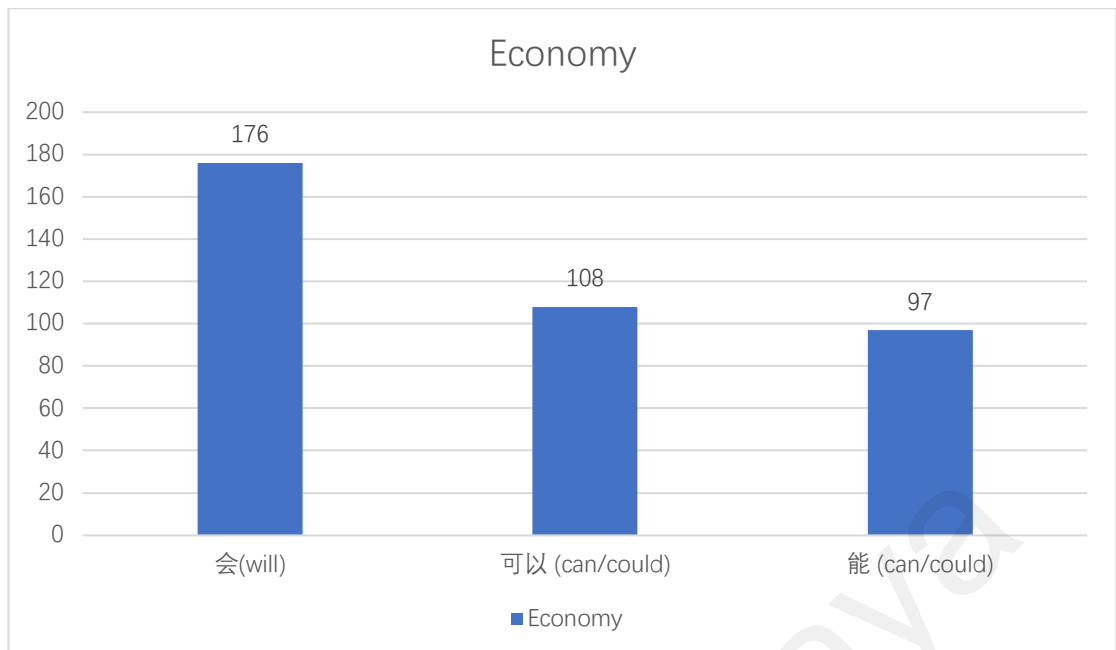
Figure 4.6 Top three preference in economy

For the discipline of Linguistics, we can see that still"会"appeared most, but apparently, the frequency of "会" is lower, and the gap gets smaller compared with other two modal auxiliaries. Compared with the discipline of economy, the top three modal auxiliaries in Linguistics appeared more equally but fewer overall. For the discipline of linguistics, we can see the top three modal auxiliaries have different implications, such as *"会"* served to predict, *"可能"* served to express possibility, "可以" served to permission or hypothesis. It is evidenced that the scholars in this area have higher degree of freedom than other disciplines. Moreover, it also appeared the situation *"可能会"* that used two modal auxiliaries together, but only appeared one time.

In summary, the scholars in discipline of linguistics have more freedom to choose modal auxiliaries but they often don't use too many in their articles.
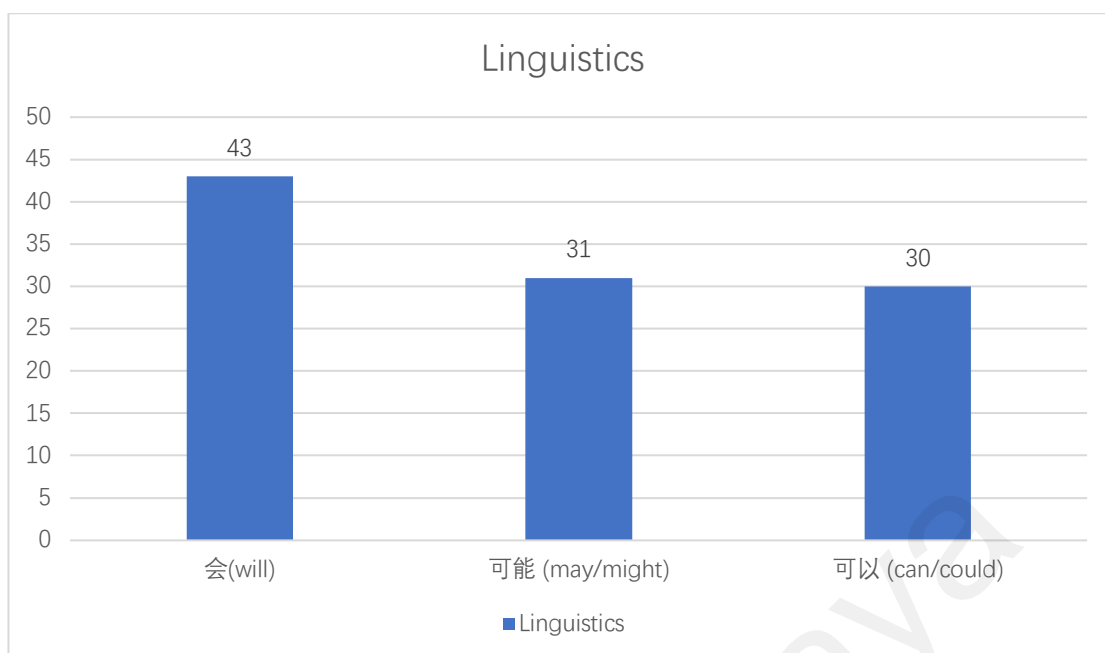
Figure 4.7 Top three preference in linguistics

For natural science, the top three modal auxiliaries are *"可以" "可能" "能".* It is the discipline least used modal auxiliaries. To examine their scholar's preference in using them is analyzed by examples. *"会"* still occupied the biggest part of overall articles for prediction,*"可以"* and *"可能"* occupied half of the overall hits in A27. There are some example*"如果将拉普拉斯对罗巴切夫斯基的影响，简单地归结为将不同事物联系起来，可能略显笼统…"(If the influence of Laplace on Lobachevsky is simply attributed to connecting different things, it may be somewhat general...) "角与边具有不同性质的度量，角的度量不需要借助其他可能变化的实体" (The measurement of an angle and a side has different properties, and the measurement of an angle does not need to be With the help of other entities that may change) "那么在几何中,边与角也可以存在依赖关系。他这样说道" "但是，可以预见,新几何的引入对力学的修正" (Then in geometry, there can also be dependencies between edges and corners. He said this" "But it is foreseeable that the introduction of new geometry will modify the mechanics)* We can see from these examples that in the discipline of natural science, the modal auxiliaries are used to put forward hypothesis and possibility. And all the modal

auxiliaries used in the theoretical analysis parts. It is found that even the pure mathematic journals, there are still some theories need to be evidenced and verified. The scholars often can infer to a conclusion, but the conclusion still needs to be verified again and again. All the studies of disciplines are centered into the break and inherit.
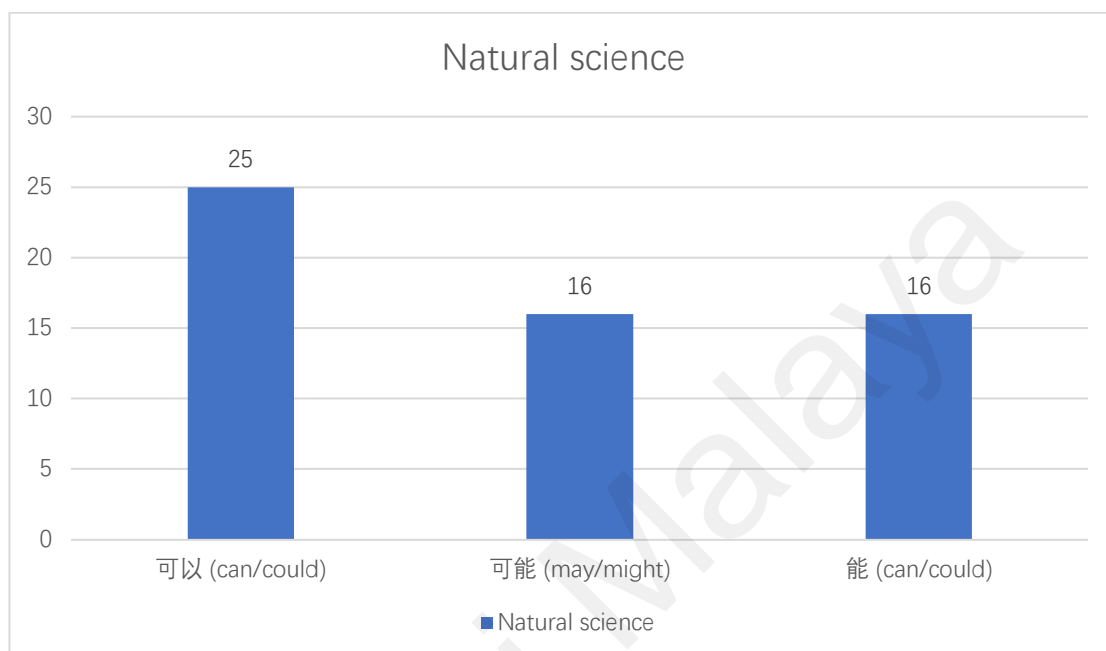
Figure 4.8 Top three preference in natural science

The data showed that *"会"* and *"能够"* appeared most in the discipline of Engineering. Here we analyzed that it may because both two modal auxiliaries show the convince to the readers. The two words in the six modal auxiliaries expressed convincing and to the readers and without any possibilities. It can be predicted that in Engineering articles, the scholars are inclined to use modal auxiliaries containing objectivity only.

But there is a difference that *"能"* and *"能够"* in a really close meaning but appeared in a different frequency in the discipline of Engineering. For answering the question, we select the example in A38, which used 20 times of "能够" but only 10 times of "能"

"它能够在可接受的计算花费下给出一个较优的可行解" (It can give a better feasible solution at an acceptable computational cost) *"它与禁忌搜索算法具有一定的相似性，都能够按照一定规则 进行新解的搜索与接受"* (It has a certain similarity with the

tabu search algorithm, and can search and accept new solutions according to certain rules) *"TSP 问题是指旅行商人需要经过 n 个城市并最终回到原点，且每个城市仅能经过一次"* (TSP The problem is that the traveling merchant needs to pass through n cities and eventually return to the origin, and each city can only pass through once)

It is found that *"能"* appeared in the supplementary sentence, but *"能够"* always served as the modal auxiliaries in main clause, and after the subject.

For the other phenomenon that the modal auxiliaries used in conjunction, there isn't find in the discipline of engineering. For the personal thinking, both the disciplines of Engineering and Natural science are mainly draw the conclusion by calculation and data. The research results are more visually, so the prediction is more reliable and objective. The conjunction word "可能会" included the meaning of possibility and prediction is not beneficial to the science and technology to verify their results. Therefore, the phenomenon isn't appeared in these materials, but still cannot exclude the possibility of using it in other articles, because our data is limited.
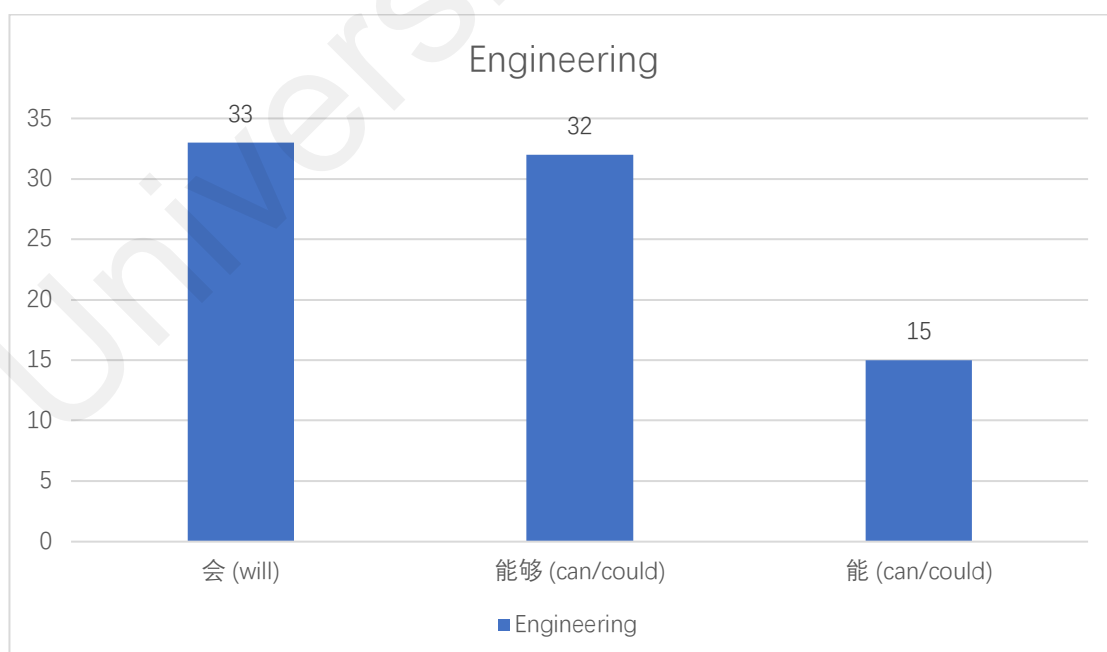
Figure 4.9 Top three preference in engineering

The study summarized the three most frequent modal auxiliaries in different disciplines. For economy, they are "会" "可以" "能"; for Linguistics, they are "会" "能够" "能"; for Natural science, they are "可以" "可能" "能"; for Engineering, they are "会" "能够" "能". We can see that all the scholars may want to express the prediction, permission and hypothesis in their articles. And the least frequent word is always "应该"in this research, which may related to scholars habits or so. Also, we can see "能够" "能" "可以" for any disciplines have high frequency, which implicated the permission and hypothesis. Therefore, the words with the implication of permission and hypothesis have critical position anyway.

Except that, we find out three preferences of Chinese scholars frequently use these Chinese modal auxiliaries in the journal articles from the four disciplines.

For the first internal element is considering their implication of the different modal auxiliaries. different disciplines acquire to convey different implications. For economy, the scholars are inclined to do the prediction, so "会" is the top one, but for the discipline of Linguistics, the scholars are not aim to do any implication intensely, because the scholars in linguistics do the summary and abstract more than research and experiments. For the disciplines of natural science and engineering, the scholars are often required to offer data to support their conclusions, so the modal auxiliaries to implicate hypothesis, possibilities and arguments come out frequently. They are more objective when they illustrate their findings.

For the second preference is the conjunctive phenomenon that the scholars are sometimes used "可能会" in their articles. However, this situation is only found out in social science disciplines, and economy occupied the most. For natural science and engineering, it doesn't find yet.

For the third preference is that the scholars use different modal auxiliaries to express the similar meaning. The example word "可以""能""能够" in different disciplines have different frequency, but their meanings is nearly. This finding arouses the discussion that why it happened.

To summary, there are three preferences on the scholars' use these Chinese modal auxiliaries in the journal articles from the four disciplines. Scholars consider the implication of each modal auxiliary and think about their adaptability in different disciplines; besides, conjunctive phenomenon appeared in the use of modal auxiliaries; lastly, some modal auxiliaries contained the same meaning, but scholars use them in different frequencies even they are in the same discipline.

4.3 Discussion

This part mainly discusses the results of the data and the research questions. Moreover, the study is to give implications and directions to the future study.

4.3.1 The Chinese modal auxiliaries appeared more in the discipline of economy than linguistics and appeared least frequent in the discipline of Natural science

The results showed that the modal auxiliaries in Chinese research articles are most frequently used in art science but least frequently used in natural science. Moreover, the economy research articles used more modal auxiliaries than the linguistics papers. The results are different from the English modal auxiliaries in these two disciplines according to T.D.'s findings (2016), who found out that in English research articles, the modal auxiliaries are used more in the discipline of Linguistics rather than Economy. Why it happens? We considered the previous studies about it.

According to Lili Z. & Longting L. (2008) study, the modal auxiliaries appeared more in social and art-science than them in natural science. Their study took nine English modal auxiliaries as research objectives, and the nine English modal auxiliaries are equivalent to our study's six Chinese modal auxiliaries. Most have the social and art

science papers require preciseness as well as natural and engineering science. Still, unlike them, social and art science often don't have the data to show the results visually. The data or theories in social and art science need to be analyzed and explained greatly. Analysis and explanation are the key to show their thoughts to the readers more precisely and objectively. Here is a question about why the economy used more modal auxiliaries than the linguistics papers. The study suspected that there is reason that make it happen in Chinese research articles. From the results, "会" "可以" "能" appeared most in the discipline of economy, but for the discipline of linguistics, the "可能" also occupied a big portion. Here is evidenced that the emphasis of the two disciplines is different. For the discipline of economy, it served as the forecasting, which is bond to the disciplinary's character. The judgement of economic trend is vital in these articles. Thus, the forecasting is not for certain but also cannot be hesitated and suspicious too much. Therefore, the modal auxiliaries in the economy appeared most often but not contained too much possibility words. Also, the future studies can concentrate on the economy and linguistics research papers, to control their variables to see their differences. It is better to analyze the differences between them.

4.3.2 What is the function of Modal auxiliaries in Abstracts of the articles in different disciplines?

From the four disciplines, the three most frequent words are "会" "可以" "能够" "能" in overall articles, also in abstracts. That's may because every discipline requires the prediction and hypotheses in their articles, especially the research question parts. It is reasonable that the three words occupied the big part of the six modal auxiliaries. It is known that modal auxiliaries are for lessen the assertiveness of the articles, but also can connect the paragraphs and sentences.

Here, we mainly discuss the *"会" "可以" "能够" "能"* are the most frequent words in Abstracts but it still in a different frequency. Table 4.9 showed the results of the most

frequent modal auxiliary in abstracts of the four disciplines. Visually, the data showed that the discipline of natural science used "能" most often, and the discipline of linguistics used "能够" most frequently; the disciplines of economy and engineering used "会" most frequently. For this, the study selected one example in each discipline's abstract. We can see that even the modal auxiliary appeared most often compared with other modal auxiliaries, it still occupied very small part of the abstracts.

For the discipline of economy *"数字金融新业态的发展会对微观企业的战略决策产生重要影响"* (The development of new digital finance formats will have an important impact on the strategic decisions of micro-enterprises) in the first sentence of the abstract of A4, the article's name is "数字金融能提升企业风险承担水平吗" (Can digital finance improve corporate risk-taking?) It is obvious that the author answered at the beginning. Moreover, it is a personal judgement for the future, so the answer is a prediction rather than a statement.

For the discipline of linguistics, we find out the last sentence from A11's abstract *"...能够弥补以往隐喻研究对其用法及共现研究的不足"* (It can make up for the deficiencies of previous metaphor research on its usage and co-occurrence) Here the modal auxiliary is for explain and add up the previous content. The modal auxiliary is not used for proposed a hypothesis instead it just used for conjunction to some degree.

For the discipline of Engineering, the example is *"流量控制会出现时变性和不稳定性"* (Flow control is time-varying and unstable) here the modal auxiliary "会" is not served as the prediction but conjunction or explanation.

For the discipline of natural science, in which "能" appeared two times as the most frequent modal auxiliary. We select one of the example *"在磁场、应力场或温度的驱动下能表现出磁热、磁致伸缩、弹热和负热膨胀等多种效应"* (It can exhibit various effects such as magnetocaloric, magnetostrictive, elastic thermal and negative thermal

expansion under the drive of magnetic field, stress field or temperature) The function of the modal auxiliary "能" also served as conjunct word for explanation rather than the hypothesis. It is objective like the modal auxiliary mentioned in the discipline of Engineering.

From the four examples in different disciplines, we find out that the modal auxiliaries in abstracts more emphasized on the explanation and conjunction. They are not serving any modal auxiliary's function in the most situations. Besides, the modal auxiliaries are not often used in the Abstracts for all the disciplines. The abstracts which represented the tone of the entire article, the author would not select the possibility words such as "可能". The modal auxiliaries appeared in the abstracts are more objective and without too many implications. It can be seen that the modal auxiliary has few functions on the abstracts of the articles.

4.3.3 The factors influenced the Chinese to achieve the semantic equivalence with English modal auxiliaries are mixed and more depends on the context

According to Wang (2014) the study, ambiguous words can be eliminated in the language environment, while hedging words cannot be eliminated in the context. Wang (2014) also added that it is important to understand the two languages' cultural background and ways of thinking. Culture and thinking both determine the use of language. Therefore, only when you understand the knowledge background of the target language, consider the target readers in the translation process, and use the expressive methods that target readers are accustomed to conveying the information. This wants to help the readers from the two different cultures understand alike. Moreover, the scholar put forward the functional equivalence, which Nida proposed to achieve the equivalence between the original and target language texts. Wang (2014) only exemplified the equivalence in literature, advertisement and travelling publicity, and found out that the key point is to know well about the cultures and backgrounds. Zhao (2006) claimed that

the use of language is inseparable from the pragmatic environment. To make the vague semantics of the language at the level of signs, syntax and rhetoric do not produce ambiguity; it must carefully consider the context and logical relations of the context before translation. Academic writing cannot leave the logic and background of the text to translate, which means if we want to achieve the equivalence of these modal auxiliaries, we need to consider the context and the background cultures as concrete as possible. Chinese modal auxiliaries, which Yang (1998) explained, Chinese do not have enough words to describe the possibilities, which means English modal auxiliaries cannot be translated to the Chinese modal auxiliaries one to one. Therefore, each Chinese auxiliary may represent two or more meanings of English auxiliaries. This situation may lead to Chinese academic writings not being as precise as English academic writing using modal auxiliaries.

Here are some examples from the results. "能" and "可能" semantically equal to can/could and may/might not only appeared often in English articles but also Chinese articles. When the author counted "能" and "可能" total hits in all forty discourses, it is found that it is not so much differences in the field of economy, and in engineering field, the author more often used "能", even more, in engineering field, there is 0 hit in the 10 articles as hedges. Then in linguistic field, "可能" appeared more than "能". Finally, the modal auxiliaries "能" and "可能" appeared nearly in natural science.

A question rose: why did the difference appear, and which one is more suitable in academic discourse? The article discussed the reasons for three aspects: discipline differences, language habits and lexical ambiguity. For the discipline difference, the possibility of "能" is more than the possibility of "可能", it can be seen from the results, except the economy, "能" used in engineering, linguistics, and natural science have average lower frequency. "能" in some cases, shows the confidence of the writer and

convey this kind of confidence to the readers. However, from the results, except the economy, linguistics used more "可能" as hedges than hits of "能" in linguistics. In the discipline of natural science, it nearly used the two hedges. What needs to pay attention is that in the discipline of engineering, the hits of "可能" appeared 0 times. For economy and linguistic discipline, they belong to art and social science, the art and social science is to study the relationship between human and human, human and society. Most things are changeable all the time and not fixed. That's why the experts, especially the academic writers, cannot speak or write assertively, resulting in a series of mistakes in future studies. Therefore, the possibility of "可能" is more suitable for art science. The engineering science is data-oriented; it should not use too many hedges to lower the assertiveness, especially possible words.

To summarize, the economy can properly use the hedges to express the possibility and the hedges for prediction. Linguistics does not need to predict much compared with economics but can use some possible hedges to express the scholar's objective opinions. On the other hand, for engineering discipline, one should avoid hedges expressing too much uncertainty, so does natural science. That's why the different disciplines have different preferences in choosing the hedges.

For language habits, Chinese are inclined to use the least word to express the maxim meanings. Therefore, "能" as modal hedges in Chinese can be used in many fields, and sometimes it does not serve the actual function. Moreover, "能" is acted briefly and faithfully, in which help writers to fulfil their articles.

It is a critical reason for the lexical ambiguity but ignored by people. Here, taking "能" and "可能" as an example, "能" included several semantic meanings, like be able to, could, would, most possibly and so on. In academic discourse, it needs to consider the readers as thoroughly as possible. Hence, a fuzzy hedging word in some degree helps to lessen the assertiveness of the"" writers' assertiveness and give readers space to think

about the results and discussions. On the contrary, "可能", even though it is a word to express uncertainty, but its semantic meaning is not as vague as "能", which may restrict the readers' thoughts, or even bad feedbacks to scholars, because they are not sure about their articles or results. Like Feng (2022) stated that "可能" both vague judgments and relatively precise judgments can be expressed. Chinese words easily carry the misunderstandings between two communicators. Although the word has fixed meanings, the scholar will also risk using it because the readers may have different understandings. Unlike English, English-speaking scholars try to find the precise word as much as possible and avoid the ambiguity. The Chinese scholars sometimes prefer to use ambiguous words to lessen their responsibility.

4.3.4 There are four common scholars' preferences on choosing the suitable modal auxiliaries in their articles

From the fourth research answers, there are some situations influenced the scholars' preferences on choosing the suitable modal auxiliaries in the articles of different disciplines. They are firstly different disciplines acquire to convey different implications; secondly the conjunctive phenomenon that the scholars are sometimes used *"可能会"* in their articles; thirdly the scholars use different modal auxiliaries to express the similar meaning. The example word "可以""能""能够"in different disciplines have different frequency, but their meanings is nearly; and lastly scholars consider the subject of the statements.

The phenomenon of conjunctive use, such as *"可能会"* but which only appeared in the discipline of economy and linguistics. It is found that the phenomenon isn't appeared in the discipline of natural science and engineering temporarily. Due to the data is limited, we cannot say the phenomenon would not appear in the discipline of science and engineering, but it can be predicted that the conjunctive use of modal auxiliaries is more frequently used in the discipline of art and social science, and less in the discipline of

science and engineering. It may because the latter one more oriented by the data, and the scholars' space of prediction and evaluation is not enough. Besides, "可能会" is the only phenomenon found out from the data, the other conjunctive uses need to be verified and checked in the further study.

Secondly, scholars in different disciplines prefer different modal auxiliaries. Each discipline has different focus and characteristics. For example, the discipline of economy requires the prediction, and the natural science require the objectivity and scientific. But the methodology of the research has influence on the use of modal auxiliaries. The articles adopted different methodologies and have different frequencies of modal auxiliary uses. It is predicted that only quantitative analysis often used fewer modal auxiliaries, and the articles applied only qualitative analysis used more modal auxiliaries compared with the articles in the same discipline. For the articles adopted mixed methodology, Interestingly, the modal auxiliary was used most frequently among the three methods. The hypotheses can be verified in the future study to see whether there is a vital influence on them.

Thirdly, the abstracts used few modal auxiliaries. Basically, the modal auxiliaries are not appeared in the abstracts. In the most situations, the modal auxiliaries are only served explanation or conjunction usage rather than the modal auxiliaries usage.

Fourthly, scholars may consider the subject of the statement. The subject of an object or a person is different in selecting different modal auxiliaries. These examples mainly appeared in the discipline of engineering when they use *"能"* and *"能够"* , which in a really close meaning but appeared in a different frequency in the discipline of Engineering. And it is found that the subject of the sentences influenced the scholars' choices.

4.4 Summary

This is the main part of the article. This part answered the four research questions. According to the results and answers, the study also proposed corresponded four issues to discuss. The study found out that 1) the modal auxiliaries are most frequently appeared in the discipline of Economy, and least frequently used in the discipline of Engineering but close enough with the disciplines of Natural science and Linguistics; 2) the Chinese modal auxiliaries in Abstracts are not the main theme compared with other hedges. "会" "可以" "能够" "能" are the most frequent words in Abstracts but there are few differences between the disciplines for using the modal auxiliaries; 3) for achieving semantic equivalence depends heavily on the minor differences between Chinese and English synonyms in different context, and scholars' conventions of language habits. And the pure semantic equivalence between English and Chinese isn't appearing; 4) there are four common preferences on selecting modal auxiliaries in the articles, which are discussed and summarized in the discussion part.

CHAPTER 5: CONCLUSION

5.0 Introduction

This chapter covers the findings obtained for research questions, implications of theories and practical, and suggestions for relevant parties and future research.

5.1 Summaries and Conclusion

This study is about modal auxiliaries as hedges in academic discourses. In 40 Chinese research papers from four disciplines, the essay studied six main modal auxiliaries as hedges. The study aims to verify whether the Chinese modal auxiliaries are significant in academic writing. And the study proposed four research questions: What are the frequency and distribution of the Chinese modal auxiliaries in the journal articles from the four main branches of the discipline? What are the frequency and distribution of the Chinese modal auxiliaries in the abstract parts of the journal articles from the four main branches of the disciplines? What are the conditions that enable Chinese modal auxiliary words to achieve semantic equivalence with English? What are the preferences on Chinese scholars frequently use these Chinese modal auxiliaries in the journal articles from the four main branches of the discipline? The study answered the four research questions, discussed and summarized the scholars' preference on choosing hedges in academic articles.

The study found out that the modal auxiliaries are most frequently appeared in the discipline of Economy, and least frequently used in the discipline of Engineering but close enough with the disciplines of Natural science and Linguistics. The Chinese modal auxiliaries in Abstracts are not the main theme compared with other hedges. "会" "可以" "能够" "能" are the most frequent words in Abstracts but there are few differences between the disciplines for using the modal auxiliaries. For achieving semantic equivalence depends heavily on the minor differences between Chinese and English synonyms in different context, and scholars' conventions of language habits.

And the pure semantic equivalence between English and Chinese isn't appearing. Also, there are four common preferences on selecting modal auxiliaries in the articles, which are discussed and summarized in the discussion part. 1) different disciplines convey different implications; 2) the conjunctive phenomenon are sometimes appeared like *"可能会"* in articles; 3) the scholars use different modal auxiliaries to express the similar meaning. Such as *"可以""能""能够"* in different disciplines have different frequency, but their meanings is nearly; 4) scholars consider the subject of the statements, the use of modality depends on their subject is a person or an objects.

A new view for choosing suitable modal auxiliaries as hedges in different disciplines is proposed generally for letting scholars from different countries know Chinese research articles better whatever in Chinese or English version. Art science is inclined to use the hedging modal auxiliaries to imply the predicted meanings. The engineering science is inclined to use the hedging modal auxiliaries implied no meanings but describe the fact faithfully.

Besides, based on the different disciplines, the choices of hedges in the art science would have a border limit compared to engineering and natural science. It is better for engineering and natural science to omit some hedging words specially to express intangibility.

The conceptual frameworks in this study were established based on theories, models and previous research findings regarding the relationship of variables. The main theories applied in this study are divided to three parts: the definitions, hedges classification and classification of modal auxiliaries, which included Lakoff (1973) & Hyland (1998), Su (2002) Coates (1983) and Song (2009) classifications, and the methodology of Hardjanto, T. D. (2016) The conclusion of the research findings can be summarized as follows: After findings and analysis, the results showed that the modal auxiliaries in Chinese research articles are most frequently used in the discipline of art

science, especially in the economy field, and least frequently used in a natural science discipline. It is found that the Chinese modal auxiliaries are significant in academic writing. If the context is as concrete as possible, the Chinese modal auxiliaries would achieve semantic equivalence with English in academic discourse.

The vital difference between disciplines is in their writing styles. The writing style of the discipline of natural science is more concise and objective. Compared with that, the discipline of social science is more subjective. According to Lili Z. & Longting L. (2008), the comparative study based on natural science and social science found that in English academic writing, the modal auxiliaries appearing in social science are more frequently than them in social natural science. The scholars also pointed out that natural science generally adopts quantifiable models and focuses on the applying experiments. Therefore, it has a detailed explanation of the experimental procedures and can obtain accurate experimental results, especially the number can be used to illustrate. So, the scholar can use the modal verbs with large possibilities. Liberal arts generally use logical reasoning, focusing more on the author's own subjective thinking. Therefore, when drawing conclusions and making suggestions, they tend to use weaker modal hedges to make their point of view easier to understand for readers. In English academic writing, this kind of difference showed in "may" and "can" is also significant. The two modal auxiliaries presented different possibilities, and the study showed a similar trend in Chinese.

5.2 Research Implications

This study has several implications for the modal auxiliaries of hedging choices from three aspects. According to the research significance mentioned earlier, the research results addressed three implications to the future study.

Firstly, English modal auxiliaries are more abundant, but Chinese scholars are inclined to select the mainstream limited vocabulary. In Chinese spoken words, the Chinese

people are inclined to use their tones to express this kind of hedges, but when they write it down, they cannot rely on the tone, because the readers cannot hear in fact. Therefore, the research studied the Chinese modal auxiliary's frequency and distribution and found out the economy used the modal auxiliaries as hedges most, and natural science used at least. The study hopes to give the Chinese scholars a broader way to think about the most appropriate way to use the hedges in different disciplines, and also in different styles of articles.

Secondly, few studies or classification standards for the Chinese modal auxiliaries. In this research, the author structured the theoretical framework by summarizing the definition of the hedging device, which used Lakoff (1973), Song's study (2009) and Hyland's theory (1998). For the modal auxiliary's classification, more Chinese scholars still obey the way of the English classification. Throughout the main classification of modal auxiliaries, the study hopes to give a direction to develop the Chinese modal auxiliary's classification.

Thirdly, the Chinese scholars used different strategies to fulfil and simplify their essays in academic writing. Nevertheless, there is no doubt that the cognition of the researchers and the readers are linked together. In Chinese articles, the author would consider the context and the readers' understanding from different cultures. According to Feng and Yu (2007), the Chinese scholars often misused the "might" in academic writings due to the different cognition of readers and writers. Thus, the study researched how to reach the Chinese semantic equivalence with English, which can let the foreign readers understand the articles better.

The study results can be applied in actual use for both Chinese and foreign scholars. To build the international view for choosing suitable modal auxiliaries as hedges, raise the consciousness of applying hedges in academic discourses. In the future, Chinese scholars need to pay attention to the misuse of modal auxiliaries such as "might ". The

study also helps the scholars to write more academically and precisely. Except the modal auxiliaries used in academic writings, they can also apply in other fields.

5.3 Suggestions

In this paragraph, we will provide some suggestions for future research, as well as discuss the limitations of the research that has been done so far for this study.

Firstly, due to the limited data, the results cannot be considered representative. Because of this, the findings may not provide a general standard or conclusion for all types of research, but they do provide a path for further research. Chinese modal auxiliaries are still important in academic writing, and future research should focus more on how they are used.

Secondly, the second question of the study asked the semantic equivalence between Chinese and English are not considered the bilingual or multilingual scholars, which can be researched whether these groups of people can use the modal auxiliaries as hedges better in their articles both in Chinese and English.

Thirdly, the study summarized and discussed the scholars' selection on Chinese auxiliaries and found out the conjunctive use in the articles. However, the appearing times are not occupied a large part, it may because the data samples are not enough, but worthwhile to be studied furthermore.

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