

The Difference between Chinese and American Primary School Science Textbooks in Arrangement of Knowledge

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Abstract—Language is not only the carrier of knowledge, but also the interpreting system of professional knowledge of different subjects. The differences in the use of language units can reflect the differences in knowledge arrangement, readability and writing ideas of textbooks. The number of linguistic units like filed words or sentences can show the amount of the knowledge to a certain degree. In this paper, we investigate the distribution of sentence amount and categories in different branches of knowledge system to reveal the discrepancy of the amount of knowledge and the compiling arrangement of knowledge content between Chinese science textbooks and the American's in the view of interpersonal function. The investigation shows that the Chinese science textbooks contain much more interrogatives and imperative sentences but less narrative sentences than the American's does. This means that the Chinese textbooks arrange too many inquiries without giving enough precise definitions and understandable interpretations of professional knowledge, increasing the difficulty of teaching and learning when teachers and students using these textbooks. In addition, when it comes to the amount of knowledge in different learning stages, the Chinese science textbooks also fail to obey the law of cognition to some extent.

Keywords—primary school science textbook, sentence category, interpersonal function

I. INTRODUCTION

Textbooks are the most basic teaching materials; the quality of textbooks directly affects the teaching effectiveness. Different countries' textbooks have different choices of knowledge, organizational arrangements, expression approaches and patterns for their different stages of development, different cultural backgrounds and educational ideas.

Language is the carrier of knowledge and can systematically interpret knowledge. Therefore, the language usage of a textbook can reflect its compiler's knowledge arrangement and educational goals. It can be helpful for making a progress in compiling textbooks to carry out a comparison between different textbook editions in different countries. This study hopes to explain the differences of knowledge capacity, arrangement and representation between the Chinese and American textbooks by analyzing the distribution and usage of sentence categories from the

perspective of interpersonal function, and provide some advices of language use for a better way of compiling textbooks in the future.

II. THE DIFFERENCE OF KNOWLEDGE ARRANGEMENT REFLECTED IN THE NUMBER AND DISTRIBUTION OF THE SENTENCES IN CHINESE AND AMERICAN PRIMARY SCHOOL SCIENCE TEXTBOOKS

A. *The Textbook Editions and Corpus Description*

In order to compare effectively, two sets of Chinese primary school science textbooks and one set of American primary school science textbooks are used as materials of the corpus. Those two sets of Chinese textbooks are widely used in Chinese primary schools. One of them is Science, the 1st edition published by Education Science Publishing House in 2004 (hereinafter the Education Science edition); the other is Science, the 7th edition published by Jiangsu Education Press in 2007 (hereinafter the Jiangsu edition). The American textbook we choose is one of the most widely used primary school science textbooks in America —Scientific Enlightenment (the Chinese edition) authorized by McGraw-Hill Education and published by Zhejiang Education Publishing Group in 2009 (hereinafter the American edition).

This study considers that the American edition is comparable at the sentence level to Chinese science textbooks for the following reasons:

First, the text of the scientific textbook is not like the literary text, the translator's personally genre is weak, so the translation sentences can be corresponded one to one;

Secondly, the sentence structure of primary school science textbooks is relatively simple. So the number and types of sentences are rarely influenced by complex sentence structures;

Thirdly, this study mainly focuses on functions of sentences with few involvements of sentence structures and automatically extracts sentences based on full-stops;

Fourthly, when we use the number of sentences to reveal the number of knowledge, we also verify it by calculating the number of knowledge points of different teaching materials.

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This can verify the reliability of the conclusions about the knowledge capacity of teaching materials.

B. Huge Differences of the total number and Grade Distribution of Sentences in Chinese and American Primary School Science Textbooks

The American primary school science textbooks start from Grade 1 to Grade 6, while the Chinese textbooks start from Grade 3 to Grade 6¹. In order to be comparable, this paper uses average number of sentences in each grade (AVG)² as the sample and gives the original number of sentences for reference at the same time.

TABLE I. THE NUMBER OF SENTENCES IN CHINESE AND AMERICAN PRIMARY SCHOOL SCIENCE TEXTBOOKS

	Jiangsu edition	Education Science edition	American edition
Total	2933	5107	24847
AVG	733	1277	4141

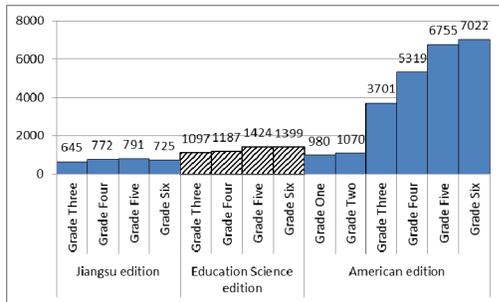


Fig. 1. The number of sentences in each grade of Chinese and American primary school science textbooks

From Table I and Fig. 1, in the distribution of the number of sentences, the number of sentences in the American textbook is much higher than the Chinese textbooks. Among those numbers, the Jiangsu edition has much fewer sentences than the other two, which may be accounted to the means of knowledge expression. According to the multi-modal survey of the three teaching materials, the Jiangsu edition has twice more pictures than the other two, for its tendency of narrating by picture instead of words. According to the dynamic distribution of the sentence in Fig. 1, the sentence numbers in each grade of the Chinese editions present even distribution. In comparison, the number of sentences in the American edition shows a significant upward trend grade by grade. We speculate that this may reveal the fact that the higher the grade is, the more knowledge is involved in the American edition. Furthermore, there might be a chance that more knowledge points are provided in each grade in the American edition than in the Chinese textbooks.

For further investigation we take three sets of teaching materials knowledge points' number of grade distribution into

¹ The beginning grades of primary school science textbooks in China and America are different, mainly due to the differences in the periods of science curriculum standards of primary school.

² Average number of sentences in each grade = the number of sentences of a certain type of knowledge / the number of grades of a certain type of knowledge.

account. It can be seen from the Fig. 1 and Fig. 2 that the characteristic of sentences' distribution and that of knowledge points' distribution in each grade of American and Chinese textbooks are similar to each other. The same with the trend of number of sentences, the American edition provides a large amount of knowledge and has an upward trend year by year, while the knowledge point number in Chinese editions shows even distribution; and the Grade distribution ratio of sentences number and that of knowledge number only gently fluctuate within 1%~5%. Thus, we come to conclusion that the number of sentences in the primary school science textbooks is positively correlated to the amount of knowledge.

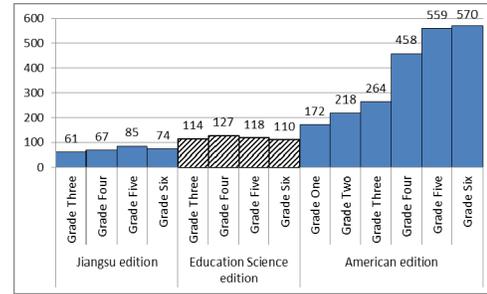


Fig. 2. The comparison of grade distribution of knowledge points between Chinese and American primary school science textbooks

III. THE USAGE OF SENTENCES IN DIFFERENT TYPES OF KNOWLEDGE

From the perspective of learning and acquisition, human knowledge is categorized into declarative knowledge and procedural knowledge by information processing psychologists. Like [1] points out: Science textbooks contain both the answer of 'what is it' classified as declarative knowledge and the answer of 'How to do' classified as procedural knowledge.

To study the relations between these two types of knowledge and the categories of sentences, we firstly divide the texts of primary school science textbooks corpus into two sets: declarative knowledge set and procedural knowledge set, and then analyze the sentence categories' distribution of each set. Specifically, the 'Exchange' and 'Hands-on' columns in the Jiangsu edition are classified as procedural knowledge contents, the American edition's columns such as 'Exploration Skills', 'Inquiry Skills Training', 'Exploration Activities', 'Small Experiments' are classified as procedural knowledge contents, and the contents of other columns are settled into the declarative knowledge.

The number of sentences of each knowledge type can reflect the arrangements of textbook compilers.

The data from Table II shows that:

Firstly, the total capacity of two Chinese editions is significantly lower than that of American textbooks.

Secondly, the Chinese editions have far more less number of declarative knowledge than that of procedural knowledge.

Thirdly, the arrangement of two kinds of knowledge in the American textbook is obviously different from that of Chinese editions. The American textbooks' number of declarative

Knowledge capacity accounted for 76.8%, which is 30% significantly higher than the Chinese editions.

Although the proportion of procedural knowledge in Chinese editions is significantly higher than that of the American's, the amount of procedural knowledge in American textbooks is even higher than that of Chinese editions in terms of the number of sentences. In order to find out the differences in ways of training children's skills between Chinese and American textbooks we need to analyze the data in categorizes furthermore.

TABLE II. THE DISTRIBUTION OF SENTENCES ATTRIBUTED TO DIFFERENT KNOWLEDGES IN CHINESE AND AMERICAN PRIMARY SCHOOL SCIENCE TEXTBOOKS

	Jiangsu edition		Education Science edition		American edition	
	Total	AVG	Total	AVG	Total	AVG
Declarative knowledge	1132	283	1546	387	19093	3182
	38.60%	38.60%	30.30%	30.30%	76.80%	76.80%
Procedural knowledge	1801	450	3561	890	5754	959
	61.40%	61.40%	69.70%	69.70%	23.20%	23.20%
Total	2933	733	5107	1277	24847	4141
	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

IV. DIFFERENCES OF SENTENCE DISTRIBUTION BETWEEN CHINESE AND AMERICAN PRIMARY SCHOOL SCIENCE TEXTBOOKS FROM THE PERSPECTIVE OF INTERPERSONAL FUNCTION

A. *The Relationship between Sentence Categories and Interpersonal Functions*

Textbook discourse can be regarded as a kind of 'a context of communication'; it is the communicative mode of 'writing expression-reading comprehension', which is often non-real-time, that is, the diachronic communication [2]. The Systemic Functional Grammar holds that the language has the function of expressing the speaker's identity, position, attitude, motive, inference, judgment and evaluation, which is called the interpersonal function of language [3]. In the process of communication, the speaker and Hearer have their own speech roles and communication contents which comprise four of the most important verbal communicative functions: 'offer', 'command', 'statement', and 'question'. The process of communication is mainly manifested by four linguistic behaviors: giving information (stating), seeking information (questioning), fetching objects and services (ordering), and giving objects and services (providing) [3]. These different communicative functions are mainly expressed by using different sentence categories. Specifically speaking, the speaker asks for information (questions) by using interrogative sentences; gives information by using declarative sentences, and asks the hearer to work (command) by using imperative sentences. Therefore, if we regard textbook as a communication mode of 'writing expression-reading comprehension', textbooks can be considered as the one who give the information while the student or the teacher is the one who receives the

information. The information provided by the textbook implies the idea of compiling, and students and teachers are getting information of science knowledge from textbooks.

Therefore, there are 4 types in the sentences of scientific textbooks: declarative sentences, interrogative sentences, imperative sentences and exclamatory sentences.

The main function of declarative sentences in textbooks is to state and interpret knowledge, for example:

The lava that pours out of the surface is exposed to the air and becomes cool and solidified quickly, which is also called igneous rock. (涌出地表的熔岩暴露于空气中,会很快冷却并凝固,这种岩石也是火成岩.) (The American edition, explanation and description)

Interrogatives have the function of raising a question or request, arousing interest, drawing up a topic, triggering thinking, leading a summary, for example:

How do we know the air exists? (我们怎么知道空气存在呢?) (The Education Science edition, eliciting the topic and triggering thinking)

Have you eaten a mixture of peas and carrots? (你吃过豌豆和胡萝卜的混合物吗?) (The American edition, leading to problems)

Imperative sentences are generally used to issue instructions or request, instruct, prompt, require the learner to complete the relevant operations, such as:

Find out the difference between rabbits and radishes and see who find the most. (找出兔子和萝卜的不同之处,看谁找得多.) (The Jiangsu edition, requiring for behaviors)

The function of expressing emotion or encouragement is not directly related to knowledge, but it can affect students' attitude to study, adjust their emotions and have suggestive effects, for example:

Look, how beautiful! (看,多漂亮啊!) (The Education Science edition)

Generally speaking, declarative sentences provide knowledge while imperative sentences ask students to practice skills. Interrogatives can illuminate students to think. The use of exclamation in scientific textbooks is generally less.

B. *Extraction and Classification of Sentence Types*

In this paper, we use the auxiliary extraction software developed by the research group to extract sentences from the corpus, after automatic labeling we make the manual checking to make sure that this corpus is reliable.

C. *The General Distribution of the Sentence Types of Chinese and American Primary School Science Textbooks*

From Table II and Table III, we can observe that: Three sets of scientific textbooks have four types of sentences, but the ratio of each type is different. As to the capacity of knowledge, we can find that the Chinese textbooks contain much more imperative and interrogative sentences than declarative sentences. It seems that the Chinese editions incline to request,

and the American edition, on the contrary, tends to provide more information than request for answers.

TABLE III. THE GENERAL DISTRIBUTION OF THE SENTENCE TYPES OF CHINESE AND AMERICAN PRIMARY SCHOOL SCIENCE TEXTBOOKS

	Jiangsu edition		Education Science edition		American edition	
	Total	AVG	Total	AVG	Total	AVG
Declarative	769	192	1753	438	17462	2910
	26.22%	26.22%	34.33%	34.33%	70.28%	70.28%
Imperative	1247	312	1194	299	3409	568
	42.52%	42.52%	23.38%	23.38%	13.72%	13.72%
Interrogative	855	214	2056	514	3782	630
	29.15%	29.15%	40.27%	40.27%	15.22%	15.22%
Exclamatory	62	16	104	26	194	32
	2.11%	2.11%	2.02%	2.02%	0.78%	0.78%
Total	2933	733	5107	1277	24847	4141
	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Fig. 2 and Table II show that the Chinese and American editions are so different in the capacity of knowledge of information. As declarative knowledge is the basis of procedural knowledge, sufficient declarative knowledge is the precondition of effective learning. Many cognitive psychology experiments have confirmed that learners need enough declarative information to understand questions accurately [4]. If learners' knowledge (declarative information) is insufficient, it's hard for them to complete the tasks and activities that the textbooks require for they are lack of declarative knowledge's support. Worse still, it may lead to the decrease of the textbook's readability and the increase of difficulty of textbook use. Thus, it deserves out attentions that there exists the huge difference of declarative knowledge points and information capacity between Chinese and American textbooks.

D. The Quantitative Analysis of Four Sentence Types in the Context of Declarative and Procedural Knowledge

Given the consideration of four sentence types, the distribution of different knowledge types in scientific textbooks will be more specific, and also the idea and expectation which are set by textbook compiler will be found more easily.

1) The distribution of sentence types in declarative knowledge texts:

TABLE IV. SENTENCE DISTRIBUTION OF DECLARATIVE KNOWLEDGE TEXT IN CHINESE AND AMERICAN PRIMARY SCHOOL SCIENCE TEXTBOOKS

	Jiangsu edition			Education Science edition			American edition		
	Rank	Total	AVG	Rank	Total	AVG	Rank	Total	AVG
Declarative	1	509	127	1	1074	269	1	16773	2796
		17.35%	17.35%		21.03%	21.03%		67.51%	67.51%
Interrogative	2	354	89	2	409	102	2	1726	288
		12.07%	12.07%		8.01%	8.01%		6.95%	6.95%
Imperative	3	92	23	3	34	9	3	413	69
		3.14%	3.14%		0.67%	0.67%		1.66%	1.66%
Exclamatory	4	21	5	4	29	7	4	181	30
		0.72%	0.72%		0.57%	0.57%		0.73%	0.73%
Total	-	976	244	-	1546	387	-	19093	3182
		33.28%	33.28%		30.28%	30.28%		76.84%	76.84%

According to Table IV, we can find that among the declarative knowledge texts, all three sets of textbooks have four sentence types. By the sequence of declarative, interrogative, imperative and exclamatory sentences, all the distribution patterns are monotone decreasing, but the American edition's is the steepest one for it has absolute superiority of the number of declarative sentences while the Jiangsu edition is the most flat one. Combined with the distribution of Fig. 2, we can see that declarative knowledge is positively correlated with the number of declarative sentences, which means that declarative sentences are the core sentence type of declarative knowledge. In addition, as interrogative sentences can arouse the topic, trigger interest, induct knowledge and be considered as an important supplementary mean of knowledge system's presentation, they are largely

used in the declarative knowledge, with the imperative sentences following them.

2) The distribution of sentence types in procedural knowledge texts:

From Table V we can see that among the procedural knowledge texts: Different from the expression of declarative knowledge, imperative and interrogative sentences are mainly used when expressing procedural knowledge. The main function of procedural knowledge is to verify, operate and guide learners to practice the research, to cultivate learners' ability of observing, researching, analyzing, to internalize declarative knowledge in experiments, and to complete the issuing of operation instructions and the execution of actions required in imperative sentences, and to cultivate students' hands-on operation skills.

TABLE V. THE DISTRIBUTION OF SENTENCE TYPES IN THE PROCEDURAL KNOWLEDGE TEXTS OF CHINESE AND AMERICAN PRIMARY SCHOOL SCIENCE TEXTBOOKS

	Jiangsu edition			Education Science edition			American edition		
	Ra nk	Total	AVG	Ra nk	Total	AVG	Ra nk	Total	AVG
Decla rative	3	260	65	3	679	170	3	689	115
		8.86 %	8.86 %		13.30 %	13.30 %		2.77 %	2.77%
Interr ogati ve	2	501	125	1	1647	412	2	2056	343
		17.08 %	17.08 %		32.25 %	32.25 %		8.27 %	8.27%
Impe rative	1	1155	289	2	1160	290	1	2996	499
		39.38 %	39.38 %		22.71 %	22.71 %		12.06 %	12.06 %
Excla mator y	4	41	10	4	75	19	4	13	2
		1.40 %	1.40 %		1.47 %	1.47 %		0.05 %	0.05%
Total	-	1957	489	-	3561	890	-	5754	959
		66.72 %	66.72 %		69.73 %	69.73 %		23.15 %	23.15 %

Three sets of textbooks are quite different in representing procedural knowledge, especially in the use of language pattern. Although imperative sentence and question are the two main sentence categories of the procedural knowledge expression, the Education Science edition obviously uses more interrogative sentences, where the interrogative chains also appear a lot, while the American edition and the Jiangsu edition use more imperative sentences instead.

In summary, observed from both the distribution of sentence types and the distribution of sentence in different knowledge text, it shows that there are obvious differences in the number of sentence types or distribution patterns within different textbooks. The Education Science edition obtains more interrogative sentences than other editions. The Jiangsu edition uses much more imperative sentences than others do, especially in the procedural knowledge texts, while the American edition contains more declarative sentences than the Chinese editions.

E. The Interpersonal Function Analysis of Sentences in American and Chinese Primary School Science Textbooks --Taking the Knowledge Point 'Water' as an Example

By taking the knowledge of 'water' which is introduced in all three sets of textbooks as the example, we analyze the language functions of getting information, asking for actions, providing information, organizing information in different sentence types. Then we explain the arrangement of knowledge and the differences of expression in three sets of textbooks. Among the three sets of science textbooks, there are few exclamation sentences and their expression function is single, for which the function of these sentences will not be discussed in this part.

1) *The analysis of sentence categories use in declarative knowledge contents:* By the proportion of declarative sentences in the three teaching Material (Table III) and that in

declarative knowledge text (Table IV), we can easily find out that the American edition pays more attention to the provision of declarative knowledge information. When introducing the 'water' knowledge, the American edition uses 271 declarative sentences that introduce a lot of information, like the nature, usage, reversing, protecting and distribution of water. In contrast, the Jiangsu edition only contains 16 declarative sentences, mainly introduces the nature, distribution and protection of water, while the Education Science edition only has 10 declarative sentences with the mention of the nature of water. It is not difficult to see that the main reason why Chinese editions contain much fewer declarative sentences is that they give quite few sub-lore points of one knowledge subject, which is not comprehensive and systematic.

It is worth mentioning that the American edition also has a considerable number of interrogative and imperative sentences. However, their functions of requesting and commanding are not that obvious. Most of the sentences are used to emphasize and remind students to pay attention to the relevant knowledge.

For example:

Remember, when the water evaporates, the minerals it contains do not evaporate, but remain. (请记住,水蒸发时,它所含的矿物质不会随之蒸发,而是留了下来。) (The American edition)

When explaining 'the distribution of water', the American edition uses 3 questions in the beginning, which the students don't really need to answer. Their actual functions are to introduce the knowledge and arouse the attention and the thinking of students. They can also work for the interpretation of knowledge, such as:

Is there more water in some places than in other places? Where can you find a lot of water? Where can I find only a very small amount of water? (有些地方的水是否比其他地方的多呢?你在哪里能找到大量的水?在哪里只能找到极少量的水?) (The American edition)

The interrogative sentences of the American edition can be further subdivided into the introduction of questions, enhanced questions, extended questions and pragmatic questions, which often appear in the first paragraph of the text. In addition, there are some questions which can summary and review knowledge often appearing at the end of the text. The interrogative sentences of the American edition are helpful to explain and narrate knowledge, while the Chinese editions have much fewer interrogative sentences, and most of them just work for asking for information. Moreover, because of the lack of specific description of knowledge, the functions of interrogative sentences in the Chinese textbooks are much fewer.

2) *The usage of sentence types in procedural knowledge texts:* From Table III and Table V, the interrogative and imperative sentences' high ratios of the Chinese editions can imply that the Chinese compilers have paid a lot of attentions on the training of critical thinking and manipulating skills.

Specifically speaking, the imperative sentences are frequently used in the Jiangsu edition, of which ratio reaches to 54.76%.

Water is a magical material. Let's get to know it by hand.
(水是一种神奇的物质,让我们通过动手来认识它.)
(‘Amazing Water’ of the Jiangsu edition)

As to the Education Science edition, when it comes to the lesson—‘Which Flows Faster’, it uses a series of questions to guide students to do experiments and think about the reasons, in which interrogative sentences accounted for 68.42%.

Furthermore, from the distribution of sentence categories in Chinese editions and their expressive function, we can infer that the problems existed in the Chinese science textbooks are that students are mostly required to make behaviors and answer questions, but they can't find any description, answers or explanations of the related knowledge points in the textbooks. Even more, some interrogative sentences, to which students can hardly find answers, relate to some important and difficult scientific principles, leading to the obvious tendency of ‘to ask rather than to explain’ in the Chinese editions. Such way of compiling can lead to an imbalance in the information structure of seeking and provision, and make it hard for students to study and read the textbooks by themselves.

What are the three kinds of liquids are the same and different? What are the same and different liquids and solids? What new knowledge do we learn about ‘water as a liquid’?
(这三种液体有哪些相同和不同?液体和固体有哪些相同和不同?对于水是怎样一种液体,我们又有了哪些新的认识?)
(A question chain in ‘Which Flows Faster’ of the Education Science edition)

The Chinese science textbooks require children to answer those questions only by doing one or two experiments without giving any knowledge information. It seems quite impossible to achieve the goal to develop the scientific skills of primary students who are relatively weak in scientific knowledge understanding and lack of enough elementary knowledge.

Overall, the American edition not only offers sufficient amount of declarative knowledge but also gives students enough guidance to think and manipulate. This can be testified in two aspects:

The number of imperative and interrogative sentences of the American edition is not less than the Chinese ones.

The number of experiments in the American edition is not much less but even more than the Chinese editions. For example, when it comes to ‘water’ knowledge, the Jiangsu edition has 12 experiments, the Education Science edition has 8 experiments and the American edition has 9 experiments. According to statistics, the Jiangsu edition has 300 experiments in total, the Education Science edition has 333 experiments, and the American edition has 438 experiments. That means the procedural knowledge texts of the American edition contain enough experiments with considerable number of questions, imperative sentences and full provision of declarative knowledge information, which will be very conducive for students to learn.

It is noteworthy that this kind of compiling of the American edition usually comes as a sequence of ‘procedural knowledge first, and then declarative knowledge’³. It seems to form an expression pattern in the American science textbook that is ‘doing experiments, asking questions, responding to the core problem or explaining the crucial knowledge, reviewing and summarizing’. The corresponding columns in the American edition are ‘Vocabulary, Preparation, Exploration, Inquiry Activities (including Materials, Activity Steps, and Drawing Conclusion), Reading and Learning, Small Experiment, Exploring Skills, Reviewing, Thinking and Writing’⁴. The order of these columns in each lesson is almost fixed.

Therefore, it can be said that the American edition's declarative knowledge and procedural knowledge are complementary to each other. The functions of sentences (to ask and to answer) act accordingly with each other. This idea of compiling is in conformity with the learning principles of ‘continuity, sequencing and integrity’ [5].

V. CONCLUSIONS

The Chinese editions should increase the knowledge capacity moderately, especially the capacity of declarative knowledge. No matter from the total number of all sentences or the number of declarative sentences and their distributions in all grades, both the total knowledge capacity and the declarative knowledge capacity of the American edition are much more than the Chinese editions.

In terms of the general distribution of declarative knowledge and procedural knowledge in Chinese editions, the quantity of interrogative and imperative sentences is much higher than that of declarative sentences. In order to avoid the absence of knowledge, we advise that the compiling of scientific textbook should pay attention to the rational disposition of declarative and procedural knowledge, and we believe that the cultivation of students' experimental skills can be implemented effectively in practice only when the essential basic knowledge is provided sufficiently.

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³ The order of columns in the American edition is ‘first procedural knowledge, then declarative knowledge’, but sometimes it also adds some experimental columns in declarative knowledge columns to help students understand the key points. These columns only appear in Grade 3 and above.

⁴ ‘Small Experiment, Exploring Skills’ only appear in Grade 3 and above in the American edition, and these columns are usually set up in the ‘Reading and Learning’ column to assist students in understanding the difficult knowledge.

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