A Study on the Cultivation of Higher-order Thinking Based on Activity Design in Senior English Textbook

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Abstract
Under the background of core competencies, cultivating learners' higher-order thinking is one of the directions of educational development. How to cultivate students' higher-order thinking is a problem worth considering for teachers. At present, it has become a trend for teachers to pay special attention to the design of English learning activities in teaching design, but to some extent, they ignore the basic link of analyzing the activity design in teaching materials, and do not make good use of existing resources. Therefore, based on Bloom's Taxonomy of Educational Objectives and from the perspective of higher-order thinking, this paper conducts data statistics on all activities in Senior English textbook (2019 edition) by Foreign Language Teaching and Research Press, and analyzes the rationality and availability of textbook activities. It aims to maximize the role of textbooks and make full use of materials, facilitating teachers to develop students' higher-order thinking through analysis and creative use of teaching materials. It is found that the textbook has rich levels of activities and more training for higher-order thinking, which meets the requirements of thinking capacity in core competencies. The arrangement of activities in the textbook conforms to the law of human cognitive development and pays attention to students' self-evaluation. Based on this, combined with the characteristics of higher-order thinking, this paper puts forward three strategies to cultivate students' higher-order thinking in textbook activities: maximizing "viewing" skill, optimizing project learning, making learning mode cooperative.
Keywords: High-Order Thinking, Senior High School English, Textbook Activity Design, Textbook Use

Introduction
    The development of thinking and language learning are closely related. On the one hand, language relies on thinking. On the other hand, language can further promote the development of thinking (Wang, 2019). Therefore, English learning helps to cultivate thinking capacity, and high level of thinking capacity will also promote English learning. *The English Curriculum Standards for Genenal Senior High Schools* (2017 edition, 2020 revision) also points out that the core competencies of English subject should be cultivated, and English teaching should be based on learning activities. The "Activity-based Approach to English

Learning" is a new educational concept that keeps pace with the times and replaces the previous mode of emphasizing task-based teaching. It adopts a series of interrelated and cyclic activities to organize English classroom teaching, including the activities of learning and understanding, applying and practicing, transferring and creating, among which there is a cyclic relationship (Wang, 2021). In short, application of Activity-based Approach to English Learning is an important way to cultivate students' thinking capacity.

With the continuous strengthening of the concept of core competencies of English subjects, scholars and teachers have improved their awareness of cultivating students' thinking. However, due to the lack of theory and practice, teachers still face difficulties in teaching practice (Zhang, 2016). At present, teachers attach great importance to the design of English learning activities, but they do not pay enough attention to the activities contained in the textbooks, and the existing resources are not well used. Whether the cause of this phenomenon is the problem of the textbook itself remains to be considered, which is also the significance of studying and analyzing the design of textbook activities. The teaching content in the textbook is about what to teach, which determines that the study of the textbook is the basic link, while the use of the textbook activities is about how to teach, and how to use the textbook activities depends on the textbook itself, teaching objectives and teachers' teaching styles. Therefore, on the basis of correctly understanding and grasping the design objectives of teaching activities of teaching materials, teachers should creatively use teaching materials according to specific learning situations, and better integrate the concept of English learning activities into the cultivation of students' core competencies of English subject, especially the cultivation of students' higher-order thinking.

In this regard, this paper selects Senior English textbook (2019 edition) by FLTRP (Foreign Language Teaching and Research Press) as the research object. Based on Bloom's Taxonomy of Educational Objectives, text analysis is used to analyze the reflection of thinking capacity in the design of textbook activities, hoping to help teachers better understand and use the activities in the textbook, promote the development of students' higher-order thinking, and promote English learning.

Higher-order Thinking from the Perspective of Cognition

Higher-order thinking is not a single thought, but a combination of multiple thinking, and a complex thinking process in which multiple cognitive components work together (Ma & Yang, 2022).

Thinking capacity is closely related to higher-order thinking. The definition of thinking capacity in the new curriculum standard is the ability and level of thinking in the aspects of logic, criticality and creativity (Ministry of Education, 2020). In the *Interpretation of English Curriculum Standards for Ordinary High School* (2017 edition), Mei and Wang (2018) divided thinking capacity into four levels, namely, identification and classification, analysis and inference, generalization and construction, criticism and innovation. Among them, the first three levels belong to logical thinking, while the last level corresponds to critical thinking and innovative thinking. Mainali (2013) pointed out that thinking is a cognitive process, and higher-order thinking includes critical thinking, reflective thinking, meta-thinking and creative thinking, while lower-order thinking refers to "knowledge", "comprehension" and "application" in Bloom's taxonomy and "remembering", "understanding" and "applying" in Anderson's revised version. Therefore, thinking capacity of the core competencies to be cultivated in English curriculum, namely logical thinking, critical thinking, creative thinking, etc., is actually a part of higher-order thinking.

Theoretical basis: Bloom's Taxonomy of Educational Objectives

Bloom (1965) classifies Educational Objectives into knowledge, comprehension, application, analysis, synthesis and evaluation, forming the Taxonomy of Educational Objectives, which exerts a great influence in the field of teaching. With the progress of society, this theory was modified and improved by his students Anderson et al., thus a revised version of Bloom's Taxonomy of Educational Objectives was created. The main changes are mainly manifested in the change from one dimension to two dimensions-types of knowledge and cognitive process, in which the cognitive process contains six cognitive levels: remembering, understanding, applying, analyzing, evaluating and creating, which go from shallow to deep, with the first three belonging to lower cognition and the last three to higher cognition (Anderson & Krathwohl, 2001).

Specifically, there are two key points. First of all, the original noun is changed into a verb, highlighting the dynamic nature of cognition. Second, adjust "creating" to the highest level. Anderson made a specific explanation and interpretation of the six levels of cognitive process, which provided a concrete and operable basis for the analysis of the textbook and the activity design in the textbook. Therefore, the revised version of Bloom's Taxonomy of Educational Objectives has stronger applicability in guiding practice.

Bloom's Taxonomy of Educational Objectives can provide a more detailed statistical standard for the study of textbook activity design. In the practice of English learning activities, there is a lack of certain theories as guidance and support in the practice process. Bloom's Taxonomy of Educational Objectives is cognitively consistent with the three types of English learning activities, but the former is stronger than the latter in terms of detail. Therefore, this paper can analyze the reflection of thinking capacity in textbook activity design according to the thinking hierarchy in the theory.

Textbook Interpretation

This study selects the 2019 new edition of FLTRP's Senior English textbook as the research object, which is compiled according to *the English Curriculum Standards for General Senior High Schools (2017 edition)* and strives to cultivate students' core competencies of English subject. Considering that the task of statistics and analysis of all the data of the series of teaching materials is time-consuming and complicated, it is inevitable that there will be omissions. Therefore, in order to reflect the design idea and logic of textbook activities more accurately, this study chooses a compulsory textbook as the research object.

Based on Bloom's Taxonomy of Educational Objectives, and combined with the activity teaching goals and specific steps set by the authors in the teacher's book, this paper explores the number of activities and the hierarchical distribution of thinking in six units of a textbook for compulsory high school English, and makes statistics on the data, which will be presented in the form of charts and analyze the frequency and percentage. Table 1 is taken as an example.

Table 1
Activity analysis of unit 4

Unit 4	Starting out	Understanding ideas	Using language	Developing ideas	Presenting ideas	Reflection	Project	Total
Remember	1	0	1	0	0	0	0	2
Understand	1	2	2	3	0	0	0	8
Apply	0	0	3	0	0	0	0	3
Analyze	0	1	1	3	1	0	1	7
Evaluate	0	1	0	1	1	1	1	5
Create	0	0	3	2	1	0	2	8
Total	2	4	10	9	3	1	4	33

When analyzing textbook activities, in order to comply with the teaching purpose of textbook writers, this author refers to teacher books and classifies the activities into different cognitive levels. According to the main purpose of the activity or the highest level of thinking that can be achieved, it is divided into corresponding activity levels. This is because some activities can be divided into different activity levels, for example, the activity related to "match" can be divided into different activity levels according to the activity requirements. The first three units in Compulsory 1 are to review the learned grammar, so the first activity in "using language" is classified as "remembering". Since it requires students to extract relevant knowledge points from the knowledge they have learned in the past, whereas in the corresponding parts of the last three units, they are classified as "understanding", that is, constructing meaning for new knowledge. The following is a detailed interpretation of the textbook from macro, middle and micro perspectives.

Macro Perspective
Thinking Level Perspective
Table 2
The proportion of lower and higher order thinking

Unit 1-6		Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Percentage	
Lower-order thinking	Remember	4	3	4	3	4	4	11%	48%
	Understand	9	14	11	8	9	9	30%	
	Apply	2	2	2	3	3	3	7%	
Higher-order thinking	Analyze	3	2	5	7	6	6	14%	52%
	Evaluate	6	6	5	6	5	6	17%	
	Create	7	6	6	8	8	7	21%	

Among the six cognitive levels, remembering, understanding and applying belong to low-order thinking, while analyzing, evaluating and creating belong to higher-order thinking (Brookhart, 2010). As can be seen from Table 2, lower-order thinking activities and higher-order thinking activities account for about half of the required textbooks, and higher-order thinking is slightly higher, indicating that the new textbooks pay more attention to the cultivation of higher-order thinking, but they do not ignore lower-order thinking, after all, higher-order thinking is built on the basis of lower-order thinking. In the lower-order thinking activities, the understanding level activities are the most, because understanding is the most

basic link of learning. "Application" belonging to lower-order thinking and "creation" belonging to higher-order thinking are similar, but "creation" is an advanced version of "application" with higher requirements, and the number of activities at the application level in this textbook is significantly less than that at the creation level, which indicates that the new textbook pays more attention to the cultivation of creative thinking. For senior high school students, their cognition is basically in the stage of formal operation, and their understanding ability has been significantly improved. Therefore, the focus should be placed on the cultivation of higher-order thinking, and this textbook has achieved this goal. It requires creative solutions to new problems based on relatively simple basic applications.

Activity Module Perspective
Table 3
The proportion of activity module in each unit

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Percentage
Starting out	2	2	2	2	2	2	5.94%
Understanding ideas	4	5	4	4	4	5	12.87%
Using language	8	9	10	10	10	10	28.22%
Developing ideas	7	7	6	9	9	7	22.28%
Presenting ideas	3	3	4	3	3	4	9.90%
Reflection	3	3	3	3	3	3	8.91%
Project	4	4	4	4	4	4	11.88%
Total	31	33	33	35	35	35	/

According to Table 3, first of all, from a vertical perspective, the total number of activities of each unit is between 31 and 35, which is basically in equilibrium. This shows that the textbook writers believe that the thematic study of each unit is important, and through the study of different themes, they can understand different Chinese and foreign cultures. Less of them is the first unit, as a unit connecting junior high school and senior high school, which is relatively simple and basic, so the number of activities is smaller than the number of activities in the later units.

Moreover, from a horizontal perspective, among all the seven modules, the two modules that are significantly more numerous than the others are "using language" and "presenting ideas". The large number of activities in the "using language" module indicates that the textbook attaches importance to practical application. The large number of activities in the "presenting ideas" module indicates that the textbook puts the cultivation of students' thinking capacity in a more prominent position. Specifically, first, the "starting out" module, accounting for 5.94% of all activities, introduces new lessons by activating students' existing knowledge and experience. Second, the "starting out" module, accounting for 12.87% of all activities, this value is not large, indicating that the new version of the textbook is no longer like the previous version of the textbook too much emphasis on understanding, but will focus more on higher-order thinking, which is a new breakthrough. Third, the "using language" module, accounting for 28.22% of all activities, is the largest proportion of all modules, indicating that textbook writers are more inclined to the use of new language knowledge. Fourth, the "developing ideas" module, accounting for 22.28% of all activities, second only to the "using language" module, which indicates that the textbook writers hope that students' thinking can be more developed. Fifth, the "presenting ideas" module, which accounts for 9.90% of all activities, has its own opinions and ideas is an aspect of thinking capacity. Sixth,

the "reflection" module, accounting for 8.91%, makes it clear that students need self-reflection and guides students to form a good habit of reflection after class, but the main energy is not here. Seventh, the "project" module, accounting for 11.88%, creatively transferred the new knowledge learned to a new situation to use them, which not only increased the interest of learning activities, but also cultivated the students' teamwork spirit.

The requirements of the new curriculum standard on thinking capacity are divided into three levels. Three levels include comparing things to find differences, analyzing differences and deducing logical relationships, finding the same features and forming the concept, having their own views on four aspects (Ministry of Education, 2020). From the first level to the highest level, the third level, these four aspects are more difficult, and the initiative of learners is more demanding. From the perspective of thinking level and activity module, the design of English learning activities in the 2019 edition of the new senior high school English textbook compiled by FLTRP meets the requirements of the new curriculum standard for thinking capacity and the curriculum standard for creative talents.

Middle Perspective
From the overall layout of the textbook, each unit is set as the seven sections of "starting out", "understanding ideas", "using language", "developing ideas", "presenting ideas". Judging from the names of each module alone, they are in line with the cognitive process of Bloom's Taxonomy of Educational Objectives.

Due to space constraints, the sequence of activities is shown in the table with abbreviations. "S1" represents the first activity "starting out". "Un1" represents the first activity "understanding ideas". "Us1" represents the first activity "using language". "D1" represents the first activity of "developing ideas". "P1" represents the first activity of "presenting ideas". "R1" represents the first activity of "reflection". And "Pro1" represents the first activity of "project" and so forth.

Table 4 Cognitive levels of each activity
It can be seen from Table 4 that the arrangement order of activities in the textbook basically conforms to the law of cognitive development, and generally follows the order which is "remembering, understanding, applying, analyzing, evaluating, creating". However, in terms of the order of evaluating and creating, creating first and then evaluating is adopted, that is, students conduct self-evaluation and peer evaluation after completing the language output, rather than just an evaluation of the knowledge they have learned. Of course, such evaluation is also included in the textbooks, such as steps like "check". This shows that the textbook not only attaches importance to evaluation, but also attaches more importance to students' self-evaluation, which gives play to students' subjective initiative.
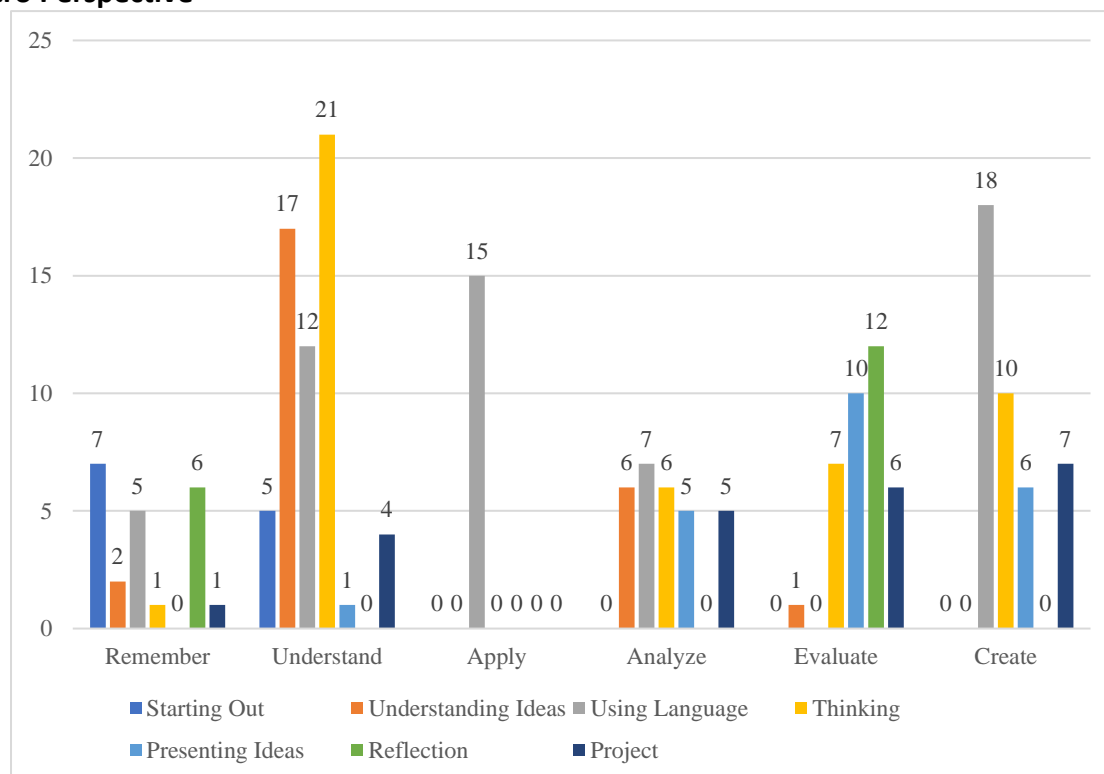
Micro Perspective

Figure 1 The distribution of each cognitive level in the activity modules

The level of remembering mainly relies on "starting out" and "using language" for two reasons. One is that teachers need to activate students' existing knowledge and experience to introduce new knowledge, which requires students to extract relevant information from memory. The other is to strengthen memory in relatively simple exercises. The level of understanding is distributed except for "reflection" module, which is mainly concentrated in the three modules of "understanding ideas", "using language" and "presenting ideas". The level of applying only appears in the "using language" section. The levels of analysis and evaluation were not involved in the background active plate, but were evenly distributed in other plates. The level of creating mainly relies on two modules: "using language" and "presenting ideas", the former is a more basic application, the latter is a creative application. In general, since understanding is the basis for the development of the mind, the level of understanding involves the largest number of modules and activities. The cultivation of higher thinking should be based on understanding in order to be effective.

In addition, through careful study, it is found that in reading texts, the activities at the analysis level in the textbook pay more attention to sorting out the structure of the text, that is, to structure the text, which is conducive to the development of students' logical thinking.

Higher-order thinking training based on textbook activities

Through the above analysis, it is found that the activity design of the new textbook has many highlights, and it is also in line with the core competencies training objectives. Combined with the requirements of the times and the characteristics of higher-order thinking, teachers may wish to pay attention to the following points from the perspective of "inside the textbook" and "outside the textbook" when cultivating students' higher-order thinking.

Maximizing "viewing" skill

In terms of the content changes of "viewing" contained in "textbooks", compared with the old textbooks, FLTRP's new senior high school English textbooks have significantly more visual elements, including full-length theme background maps, film and television clips, word cloud maps, data charts, etc., which form a visual impact, which is the impact of information technology on education.

"Viewing" is one of the important language skills in the context of the information society, and it is also a way to effectively cultivate students' thinking (Xiong, 2023). As a new language skill in the new curriculum standard, "viewing" is the social requirement of advancing with the times, and it is also the way to effectively train students' thinking. In the first section of each unit, the background activation is to introduce the topic in the way of "viewing". Of course, this section can not only exercise students' "viewing" skills, but also design "viewing" skills in other sections. For example, in the "understanding ideas" module, teachers can make use of various charts and graphs of multiple modes to simplify the text when understanding the article. It can improve students' logical thinking ability. Teaching students to use "viewing" as a learning aid is also key to understanding visual information.

Optimizing Project-based Learning

The "project" module of "inside the textbook" is different from the former six modules. It concentrates on the practical activities of six units, which are located at the back of the textbook. The "project" module is a typical project-based learning, with the concept of "learning by doing". Starting from the review, guided by the project, the activity runs through the whole time, and the application is returned. In the way of teacher-student interaction, student-student communication and group cooperation, more opportunities are provided for students to carry out situational output exercises. However, the "project" module is often overlooked.

When using the learning activities in the "project" module of the textbook, the teachers should pay much attention to the following key points. First, the authenticity of the activity should be analyzed based on the students' life experience. Only when the work is done in a completely real situation can it be connected to the real world. If it is not very real to the students in the class, then it is best not to use the activity. For example, the project topic of Unit 5 is "Identifying and correcting mistranslations", and the activity requirement for the first activity is "Work in groups, think about public places where you might see English translations, for example, road signs and restaurant menus. Decide where to go." If learners live in a region where there is less English available around them, then the project will lack a certain degree of authenticity for them and will be difficult to complete. Then at this time, it is necessary to combine the specific learning situation and replace the project theme or form. Second, having completed the project, the teacher guides students to conduct multi-dimensional reflection. During the project learning process, students are encouraged to think about the investigation and implementation, and to reflect on their own learning habits and research methods, so as to improve their critical thinking ability. As can be seen from Table 4, the last of the four activities in the "project" module of six units must be the activity of "evaluating".

Making Learning Mode Cooperative

Although the textbook itself is important, it is also necessary to pay attention to the "outside the textbook" learning mode, which should be student-centered. The learning mode based on teacher-student interaction or peer interaction promotes the development of

students' higher order thinking (Ma & Yang, 2022). Although cooperative learning has long been advocated, in the actual classroom, there will be formal cooperative learning, students just sit around together, lack of effective communication and interaction, which is not the real sense of cooperation. Cooperative learning in the true sense is to construct knowledge in the process of communicating and interacting with others, and to form multi-perspective views on complex issues. In cooperative learning, creative thinking can be greatly developed.

Many activities in the textbook are required to be carried out in interaction, such as "work in pairs", "work in groups", "share", etc. In the last part of the "understanding ideas" module, a "think and share" step is set up, which aims to exchange views with others after thinking about deep-level problems individually. giving students a new perspective. In the actual classroom, the teacher may skip the interaction and cooperation link directly in order to save time, which is just unwise and not conducive to the development of students' higher-order thinking. In addition, in group communication and interaction, teachers are required to build reasonable cooperative groups and set group members with the same or different knowledge levels according to the learning goals.

Conclusion

Senior English textbook (2019 edition) by Foreign Language Teaching and Research Press were written under the background of *The English Curriculum Standards for Genenal Senior High Schools* (2017 edition, 2020 revision). According to the Bloom's Taxonomy of Educational Objectives, the new textbook conforms to the law of learners' cognitive development and pays attention to students' self-reflection and the development of higher-order thinking on the basis of lower-order thinking. Adhering to the idea of "making the best use of everything", the textbook itself cannot be ignored. Under the guidance of the core competencies, teachers should analyze the levels of activities in the textbook, in accordance with the actual conditions of students in the class and the requirements of the times, to cultivate students' "viewing" skill. Besides, strengthening students' sense of cooperation through project-based learning is also significant, which means learning by doing and innovating in communication.

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