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Research on the Design of Question Chains for Senior High School English Reading Towards Deep Learning — From the Perspective of Big Unit Teaching

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Abstract

The General Senior High School English Curriculum Standards (2017 Edition revised in 2020) advocates holistic unit teaching guided by thematic meaning to promote students' deep learning oriented by core subject competencies. Currently, senior high school English reading teaching is trapped in fragmentation and superficiality, with scattered factual questions failing to support students' in-depth thematic exploration. From the big unit teaching perspective, this study constructs a two-tier question chain design framework of "unit main question chain + lesson sub-question chain" based on deep learning theory, Bloom's taxonomy and the view of English learning activities. It proposes four core design principles and elaborates specific implementation paths with a textbook unit case. The research proves that the hierarchical question chain under the big unit perspective can effectively break the limitation of single-text reading, promote students' cognitive progression from lower-order thinking to higher-order thinking, and realize deep learning in English reading.

Keywords

Deep Learning; Question Chain; Big Unit Teaching; Senior High School English Reading; Core Competencies

1. Introduction

1.1. Research Background

The new round of senior high school English curriculum reform takes core competencies as the general goal and emphasizes the educational value of holistic unit teaching. As the core channel of language input, reading undertakes the task of cultivating students' language competence, thinking quality and cultural awareness. In teaching practice, however, most reading classes still follow the traditional mode of vocabulary explanation, sentence translation and exercise checking. Teachers'

questions are mostly isolated factual questions, and students' reading stays at the level of superficial information extraction, resulting in fragmented and shallow learning outcomes. Existing studies on question chains mostly focus on single-text design and lack a holistic unit perspective, which makes it difficult to support students' deep construction of thematic meaning. Therefore, exploring the design of reading question chains for deep learning from the big unit perspective is an urgent demand for implementing the new curriculum standards and solving practical teaching dilemmas.

1.2. Research Purpose and Questions

This study aims to construct a question chain design system for senior high school English reading towards deep learning from the big unit perspective, and verify its application value. The core research questions are:

1. What design principles should English reading question chains for deep learning follow from the big unit teaching perspective?
2. How to construct the "unit-lesson" two-tier question chain design framework and implementation path?
3. How to apply the design system in teaching practice and what is its practical value?

2. Literature Review and Theoretical Foundation

2.1. Definition of Core Concepts

Deep learning is a cognitive processing process as opposed to surface learning. It refers to the learning process in which learners critically absorb new knowledge on the basis of understanding, integrate it into the original cognitive structure and establish extensive connections, and finally transfer the learned knowledge to new situations to solve real problems. In the context of senior high school English reading, deep learning is not simply the deepening of language knowledge, but reflects that students can not only understand the literal information of the text, but also analyze discourse structure, infer the author's intention, evaluate viewpoints and attitudes, explore thematic meaning, and transfer reading gains to real language use scenarios, so as to realize the coordinated development of language competence and thinking quality.

A question chain is a set of logically connected and progressive question sequences designed by teachers around teaching objectives and combined with students' cognitive level. Led by core questions, it covers four levels: basic, inferential, critical and innovative, which can guide students' thinking from the shallow to the deep and realize step-by-step cognitive improvement.

Big unit teaching is a teaching form guided by themes and centered on unit big ideas, which overall plans discourses, activities and evaluation within the unit. It breaks the isolated teaching mode of single texts, emphasizes the relevance and

progression between lessons, and promotes students to form a structured knowledge system and complete thematic cognition.

2.2. Literature Review at Home and Abroad

The concept of deep learning was first proposed by Swedish scholars Marton & Säljö in 1976, who distinguished two levels of learning processing: deep level and surface level through experiments. Domestic scholar Guo Hua (2016) systematically explained the educational connotation of deep learning and pointed out that it is an inevitable path for cultivating core competencies. Wang Qiang (2021) proposed that deep learning in English reading should point to thematic meaning exploration and tap the educational value of texts.

In terms of question chain teaching research, Liu Honggang & Gao Lixiang (2023) defined the connotation and core characteristics of question chains in senior high school English classrooms. Liu Liu (2024) constructed a question chain-driven 5E reading teaching model. On the whole, most existing studies focus on single-lesson teaching scenarios and lack systematic design research from a holistic unit perspective.

In the field of big unit teaching, Zhang Jinxiu (2019) proposed the idea of unit-based holistic teaching design led by thematic meaning exploration, emphasizing the leading role of core questions. Cheng Xiaotang (2018) demonstrated the necessity of hierarchical design of unit activities from the perspective of English learning activities. However, current studies mostly focus on macro frameworks, and micro design research on reading question chains is still relatively scarce.

2.3. Theoretical Foundation

Bloom's taxonomy of educational objectives divides cognitive objectives into six levels from low to high: memory, understanding, application, analysis, evaluation and creation. It provides a scientific basis for the hierarchical division of question chains and guides question design to climb from lower-order cognition to higher-order thinking.

Constructivist learning theory holds that learning is the process of learners actively constructing meaning rather than passively receiving information. By creating cognitive conflicts and inquiry situations, question chains support students to independently sort out information and construct thematic meaning, which is consistent with the essential characteristics of deep learning.

The view of English learning activities divides learning activities into three categories: learning and understanding, application and practice, transfer and innovation, which highly correspond to the four levels of question chains. It provides a subject-specific practical framework for integrating question chains into classroom teaching and ensures that the design conforms to the teaching characteristics of English discipline.

The three theories together constitute the theoretical support system of this study from three dimensions: cognitive level, learning essence and disciplinary characteristics, ensuring the scientificity and adaptability of question chain design.

2.4. Research Review

To sum up, existing studies have laid a solid theoretical foundation for this research, but there are still two obvious deficiencies. First, the research vision is limited. Most studies focus on question design of single lessons and lack the construction of a question system running through multiple discourses from a holistic unit perspective. Second, the practical path is vague, and there is a lack of systematic and replicable question chain design frameworks and complete teaching cases. In response to the above deficiencies, this study constructs a reading question chain design system towards deep learning from the big unit perspective to fill the gaps in existing research.

3. Construction of Question Chain Design System from the Big Unit Perspective

3.1. Core Orientation of the Design

The question chain design system constructed in this study takes unit big ideas as the guide, deep learning as the goal, and hierarchical questions as the carrier. Its core is to break the fragmentation limitation of single-text reading and realize the cognitive progression of "in-depth interpretation of single text—integration of multiple texts—construction of unit theme". It transforms unit education objectives into operable classroom inquiry tasks and promotes the coordinated development of students' language competence and thinking quality.

3.2. Basic Design Principles

Principle of Theme Guidance. Question chain design must anchor unit big ideas, and all questions revolve around the exploration of thematic meaning. Unit main questions directly point to big ideas, and lesson sub-questions serve the phased solution of main questions, forming a "general-part" question system to ensure that students gradually deepen their thematic cognition in problem solving.

Principle of Hierarchical Progression. Based on Bloom's cognitive taxonomy, question design gradually transitions from factual lower-order questions to analytical, evaluative and innovative higher-order questions. The question chain within a single lesson realizes micro hierarchical progression, and the question chain of the whole unit reflects macro spiral rise, promoting the continuous deepening of students' thinking.

Principle of Logical Relevance. The internal logic of question chains must be consistent with the development logic of discourses and the arrangement logic of units. Single-text questions follow the narrative and structural context of the text,

and questions of different lessons in the unit form progressive connections, realizing the organic unity of "text logic, teaching logic and learning logic".

Principle of Situational Transfer. Question design must connect real life scenarios, gradually guide students to step out of the text, transfer and apply reading gains to real language contexts, realize the transformation from "learning English" to "using English to do things", and implement the transfer requirement of deep learning.

3.3. Two-Tier Overall Design Framework

This study constructs a two-tier design framework of "unit main question chain + lesson sub-question chain" to realize the organic combination of big unit overall guidance and single-lesson in-depth interpretation.

The unit main question chain consists of 3 core questions, with three characteristics: openness, inquiry and guidance. It runs through the whole unit learning process and directly points to the in-depth construction of unit big ideas. It cannot be directly answered through single-text reading and needs to be gradually improved with multi-discourse learning.

The lesson sub-question chain is developed in four levels: basic questions, inferential questions, critical questions and innovative questions. It serves the phased solution of unit main questions, completes the in-depth interpretation of a single text, and is the implementation carrier of the unit main question chain in a single lesson.

The two tiers of question chains form a close linkage mechanism: the unit main question chain determines the design direction and thinking level of lesson questions, and the lesson sub-question chain accumulates cognition by gradually solving problems. Together, they complete the solution of unit core questions and promote students to move from single-text understanding to holistic deep learning of the unit.

3.4. Systematic Design Paths

The first step is unit top-level design. Teachers should deeply interpret curriculum standards and textbooks, analyze the thematic context and educational value of the unit, and refine unit big ideas. Following the logic of "what—why—how", three progressive unit core questions are designed to form the unit main question chain.

The second step is lesson disassembly and implementation. Combined with the content characteristics and functional positioning of each single discourse, the unit main questions are disassembled into corresponding hierarchical lesson sub-question chains, realizing the complete progression from basic cognition to transfer innovation through four levels of questions.

The third step is classroom dynamic generation. On the basis of preset question chains, teachers should keenly capture valuable generative questions in class and dynamically adjust the question sequence. Supplement scaffolding questions when

students' thinking is blocked, and expand extended questions when students' thinking is active, so as to realize the dialectical unity of presupposition and generation.

The fourth step is the construction of evaluation closed loop. Process evaluation should be embedded, balancing result evaluation and process evaluation, integrating teacher evaluation, student self-evaluation and peer evaluation to form a learning closed loop of "question—inquiry—evaluation—optimization", ensuring that deep learning truly occurs.

4. Teaching Case Design and Implementation

4.1. Case Selection and Unit Overall Analysis

This case selects Unit 3 Diverse Cultures from PEP Senior High English Compulsory Book 3 as the research carrier, and the selection is based on two core considerations. On the one hand, this unit falls under the thematic context of "man and society", which is one of the three major thematic contexts specified in the General Senior High School English Curriculum Standards. The theme of cultural diversity is a core carrier for cultivating students' cultural awareness and critical thinking, and it highly matches the educational goal of deep learning oriented by core competencies. On the other hand, the unit is rich in discourse types, including travel journals, expository texts, news reports and argumentative fragments, which cover multiple discourse functions such as phenomenon description, value analysis and practical reflection. This multi-discourse structure provides sufficient content support for the construction of a two-tier question chain, and can fully reflect the holistic and progressive characteristics of big unit teaching, so it has strong representativeness and practical reference value.

From the overall structure of the unit, it is composed of five core modules: Listening and Speaking, Reading and Thinking, Discovering Useful Structures, Reading for Writing, and Assessing Your Progress. Among them, the Reading and Thinking module, as the core reading part, undertakes the function of fact perception and preliminary theme exploration; the Reading for Writing module expands the theme connotation on the basis of the previous text, and undertakes the function of deepening cognition and language output. Each module progresses layer by layer around the theme of cultural diversity, forming a complete learning closed loop from input to output, which provides a natural logical basis for the design of the unit main question chain.

Combined with curriculum standard requirements and textbook content, the big idea of this unit is established as: Cultural diversity is a precious wealth of human society, and respecting cultural differences and promoting exchanges and mutual learning between civilizations are important qualities of contemporary youth. Around this big idea, the unit teaching objectives are set in three detailed dimensions. In terms of language competence, students are expected to master core

vocabulary and fixed expressions related to cultural description, geographical features and emotional expression, be able to extract key information and sort out discourse structure from travel journals and expository texts, and improve reading skills such as skimming, scanning and inferential reading. In terms of thinking quality, students can sort out the manifestations of cultural diversity through text reading, dialectically analyze the dual impacts of cultural diversity on urban development and social progress, and develop higher-order thinking abilities including analysis, induction, evaluation and dialectical argumentation. In terms of cultural awareness, students can perceive the richness of global multiculturalism, establish the concept of cultural inclusiveness and equality, enhance their identification with excellent Chinese traditional culture while understanding foreign cultures, and initially form the awareness of cross-cultural communication and mutual learning.

4.2. Design of Unit Main Question Chain

Around the unit big ideas, following the cognitive logic of "perception—analysis—application" and the progressive logic of "what—why—how", a three-level progressive unit main question chain is designed, which corresponds to the three stages of unit learning and matches different discourses and teaching modules respectively.

The first main question is "What forms of cultural diversity are presented in the unit texts?", which is at the fact perception level and corresponds to the early stage of unit learning. This question mainly relies on the Reading and Thinking module and the Listening and Speaking module. Students can sort out the specific manifestations of cultural diversity in architecture, diet, folk customs, language and other aspects through reading the travel journal and listening to the introduction of multicultural cities. This question is at the lower cognitive level of memory and understanding, aiming to help students accumulate perceptual cognition of cultural diversity and lay a factual foundation for subsequent in-depth exploration.

The second main question is "What values and challenges does cultural diversity bring to the development of human society?", which is at the value analysis level and corresponds to the middle stage of unit learning. This question mainly relies on the Reading for Writing module and extended reading materials. On the basis of understanding the manifestations of cultural diversity, students further explore the promoting effect of cultural diversity on urban vitality, technological innovation and cultural inheritance, and at the same time rationally analyze the possible challenges such as cultural conflict and social integration. This question rises to the cognitive levels of analysis and evaluation, aiming to guide students to jump from phenomenon perception to value judgment, and form a rational and dialectical understanding of cultural diversity.

The third main question is "How can we promote cross-cultural communication and

mutual understanding in daily life?", which is at the practice transfer level and corresponds to the late stage of unit learning. This question mainly relies on the Writing module and the Project part of the unit. On the basis of forming value cognition, students combine their own life experience and social reality to think about the specific methods of cross-cultural communication, and put forward practical suggestions for promoting cultural mutual learning. This question reaches the cognitive level of creation and application, aiming to promote students to internalize theme cognition into behavioral consciousness and realize the transfer of knowledge and ability to real situations.

The three main questions run through the whole unit learning process, gradually deepen with the reading of different discourses and the advancement of teaching activities, and form a complete closed loop of thematic exploration from perceptual cognition to rational analysis and then to practical application at the end of the unit. The progressive design of the main question chain ensures that the unit learning always revolves around the core big idea, and promotes students' deep understanding of the theme in a step-by-step manner.

4.3. Design and Implementation of Core Reading Lesson Sub-Question Chain

The core reading discourse Li Lan's Travel Journal in the Reading and Thinking module is selected as the teaching content of this lesson. This lesson is the second teaching period of the unit. It is undertaken after the listening and speaking introduction class, and undertakes the core task of in-depth text interpretation and preliminary theme exploration. Through Li Lan's one-day travel experience in San Francisco, the article shows the urban multicultural landscape formed by immigrant culture, and undertakes the function of cultural phenomenon perception in the unit. It mainly serves the solution of the first unit main question, and at the same time infiltrates the thinking of the second main question through the setting of higher-order questions, playing a connecting role in the whole unit teaching. The teaching objects are senior one students, who have basic English reading ability and information sorting ability, and have initially understood the background of American immigrant culture in the previous class. However, their ability of in-depth text interpretation and inferential reading is insufficient, and their critical thinking awareness is relatively weak, so they need to be guided to think deeply step by step through hierarchical questions.

A four-level sub-question chain is designed for this lesson, and the specific implementation process is as follows:

The first level is the basic question level, corresponding to the memory and understanding levels of Bloom's cognitive taxonomy, and its core goal is to help students perceive the text and sort out basic information. The specific questions include: ① According to the journal, which places did Li Lan visit in turn during her

trip in San Francisco? ② What cultural characteristics of different ethnic groups did she observe in each scenic spot? ③ How is the travel journal organized, and what narrative clues run through the full text? In the implementation process, after the class introduction, the teacher first presents the questions to guide students to read the text independently with the questions. Students complete the information sorting through skimming and scanning, and fill in the travel route and cultural characteristic information table independently. Then the teacher checks the answers with the whole class, sorts out the narrative clue of "travel route", and explains key vocabulary and difficult sentences appropriately. This link takes about 10 minutes, aiming to help students clear language obstacles, grasp the basic content and structural framework of the text, and lay a solid foundation for subsequent in-depth inquiry.

The second level is the inferential question level, corresponding to the application and analysis levels of Bloom's cognitive taxonomy, and its core goal is to guide students to go deep into the text and interpret the deep connotation. The specific questions include: ① Why did Li Lan say that "San Francisco is a city built by immigrants"? What textual evidence can support this view? ② What does the writer want to convey to readers by describing the scene of Chinatown in detail? ③ How did Li Lan's mood change during her trip, and what factors caused these changes? In the implementation process, students carry out group discussions in groups of 4. The teacher patrols and guides each group, reminding students to find basis from the details of the text and avoid empty discussion. After the discussion, each group sends representatives to share their views, and the teacher supplements and summarizes the historical background of American immigration and the formation of Chinatown, helping students understand the deep reasons for the formation of multiculturalism. This link takes about 12 minutes, guiding students to shift from "reading content" to "reading logic", realizing the first cognitive progression from superficial information to deep meaning.

The third level is the critical question level, corresponding to the evaluation level of Bloom's cognitive taxonomy, and its core goal is to guide students to jump out of the text and make rational judgment. The specific questions include: ① For a city like San Francisco, what advantages might cultural diversity bring to its economic development and social vitality? What potential challenges may it face at the same time? ② Do you think the description of cultural diversity in this travel journal is comprehensive enough? Why or why not? In the implementation process, the teacher organizes in-depth class discussions, encourages students to put forward different views, and guides students to think dialectically from multiple angles. For the second question, the teacher can appropriately supplement other perspectives of multicultural research to expand students' thinking. This link takes about 8 minutes, aiming to cultivate students' critical thinking ability, break through the limitation of text narrative, and initially echo the exploration of the second unit main

question.

The fourth level is the innovative question level, corresponding to the creation level of Bloom's cognitive taxonomy, and its core goal is to connect real life and realize knowledge transfer. The specific tasks include: ① Suppose you are a volunteer guide introducing Chengdu to foreign exchange students, how would you present the cultural characteristics of your hometown to them? ② What suggestions would you put forward to help teenagers better adapt to a multicultural environment and carry out friendly cross-cultural communication? In the implementation process, students choose one task to complete oral or short written output, and then carry out display and exchange in the class. The teacher evaluates and gives feedback from the dimensions of language expression, logical thinking and viewpoint innovation. This link takes about 10 minutes, aiming to create real language use situations, promote the transfer of reading gains to real life, and point to the practical implementation of the third unit main question.

4.4. Case Reflection

On the whole, this teaching case verifies the feasibility and practical effectiveness of the two-tier question chain design framework from the big unit perspective, and its advantages are mainly reflected in three aspects. First, the hierarchical question design conforms to students' cognitive development law. The four-level sub-question chain progresses from easy to difficult, which effectively reduces the cognitive threshold of students for deep text interpretation, and drives students' cognitive progression step by step. Second, the two-tier question chain realizes the organic connection between lessons and units. The sub-question chain of a single lesson always serves the solution of the unit main questions, which breaks the isolated state of traditional single-text teaching and reflects the holistic concept of big unit teaching. Third, the design of situational and higher-order questions effectively improves students' classroom participation. Compared with the traditional reading class focusing on knowledge explanation, students in the question chain teaching class have significantly higher thinking participation, and their enthusiasm for inquiry and expression is fully stimulated.

Combined with the teaching practice effect, three inspirations can be summarized for the implementation of question chain teaching. First, teachers should flexibly adjust the question gradient according to the actual learning situation to meet the learning needs of students at different levels. For students with weak foundation, more detailed guiding questions can be added between basic questions and inferential questions to build cognitive scaffolding; for students with strong ability, extended questions with higher difficulty can be appropriately added to further expand their thinking depth. Second, teachers should reasonably control the teaching rhythm and reserve sufficient time for the exploration of higher-order questions. In actual teaching, the basic link is easy to occupy too much time due to

language knowledge explanation, which squeezes the discussion time of critical and innovative questions. Teachers should clarify the key points of teaching, appropriately simplify the explanation of low-value language points, and ensure that higher-order thinking activities can be fully carried out. Third, teachers should attach importance to the educational value of generative questions and transform them into effective classroom inquiry resources. In the discussion process, students often put forward unexpected viewpoints and questions. Teachers should not simply pull students back to the preset track, but should keenly capture valuable generative resources, integrate them into the question chain appropriately, and stimulate more in-depth thinking and inquiry in the class, so as to make the question chain grow dynamically in teacher-student interaction.

5. Implementation Guarantee Strategies of Question Chain Teaching

5.1. Improving Teachers' Unit Overall Design Competence

Teachers are the core subject for the implementation of question chain teaching. Teachers need to change the thinking inertia of single-lesson lesson preparation, establish the awareness of unit-based holistic teaching, deeply study curriculum standards and textbooks, and accurately grasp unit big ideas and educational value. Meanwhile, they should actively improve the professional ability of question design and master professional tools such as cognitive classification and discourse analysis to ensure the logic and hierarchy of question chains. Schools can provide professional support for teachers through collective lesson preparation, thematic teaching and research, and expert training to improve the team's ability of unit-based holistic teaching design.

5.2. Balancing Presupposition and Generation in Classroom

In classroom implementation, it is necessary to avoid rigid implementation of preset questions, create a democratic and open dialogue atmosphere, and encourage students to put forward personalized views and questions. Teachers should have curriculum generation awareness, keenly capture valuable generative resources, transform them into new question growth points, and dynamically optimize the question chain. At the same time, they should play a good guiding role and seek a balance between open inquiry and goal focus, ensuring that question inquiry is full of vitality without deviating from the core theme of the unit.

5.3. Taking into Account Students' Differentiated Development Needs

In view of the differences in students' cognitive levels and language foundations, flexible layered question chains should be designed: students with weak foundation focus on basic and inferential questions to consolidate reading foundation; students with strong ability focus on critical and innovative questions to develop

higher-order thinking. Adopt group cooperative learning with mixed grouping to achieve common progress through peer assistance. Strengthen individual guidance for students with learning difficulties, reduce cognitive thresholds through scaffolding questions, and improve their classroom participation and learning confidence.

5.4. Constructing a Multiple Process Evaluation System

It is necessary to change the single result-oriented evaluation method and construct a multiple process evaluation system. The evaluation content covers multiple dimensions such as answer accuracy, thinking depth, participation degree and cooperative performance, comprehensively reflecting students' learning process. The evaluation subjects integrate teacher evaluation, student self-evaluation and peer evaluation, giving full play to the diagnostic, incentive and developmental functions of evaluation. Through promoting learning by evaluation, a virtuous closed loop of integration of teaching, learning and evaluation is formed to effectively guarantee the implementation effect of deep learning.

6. Conclusion and Prospect

6.1. Main Research Conclusions

Based on the perspective of big unit teaching, this study systematically constructs a question chain design system for senior high school English reading towards deep learning, and mainly draws three conclusions: First, the deep integration of big unit teaching and question chain teaching can effectively solve the current dilemma of fragmentation and superficiality in reading teaching, and is an effective path to implement English core competencies and promote students' deep learning. Second, theme guidance, hierarchical progression, logical relevance and situational transfer are the four core principles that must be followed in the design of question chains towards deep learning. They guarantee the quality of question chains from four dimensions: goal direction, cognitive law, internal logic and value implementation. Third, the two-tier structure of "unit main question chain + lesson sub-question chain" can realize the organic unity of unit overall guidance and single-text in-depth interpretation, guide students to gradually deepen thematic meaning exploration, and promote thinking to leap from lower order to higher order.

6.2. Limitations of the Research

This study still has certain limitations. The research mainly focuses on theoretical construction and case analysis, lacking quantitative data support from large-sample teaching experiments. The improvement effect of question chains on students' reading ability and thinking quality needs further verification. The case only selects narrative texts with multicultural themes, and the universality of the design system in different themes and genres needs further discussion.

6.3. Prospect of Future Research

Future research can be deepened from two directions. First, strengthen empirical research, expand research samples, and quantitatively test the actual effect of question chain teaching through teaching experiments and questionnaires. Second, expand the research scope, explore the differences in question chain design for different themes, genres and learning stages, and enrich case resources and design systems. In addition, we can also explore the integration path of information technology and question chain teaching, optimize the implementation and evaluation process with the help of smart education tools, and provide more practical references for the reform of senior high school English reading teaching.

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