

The Design of Problem Chain is to Explore the Cultivation of Students' Thinking Quality in High School English Reading Teaching

Xiangjun Chen

Chongqing Normal University, Chongqing 40041, China

Abstract: This study focuses on the thinking qualities cultivation goals proposed in the "Senior High School English Curriculum Standards (2017 Edition)" and explores the role of problem chain design in fostering students' cognitive qualities in high school English reading instruction. It aims to provide data and theoretical support for English reading instruction practices and related research, promoting the effective implementation of cognitive quality cultivation in high school English classrooms.

Keywords: Problem Chain; Thinking Quality; English Reading Teaching.

1. Introduction

The "Senior High School English Curriculum Standards (2017 Edition)" proposes four core competencies for the subject, with thinking quality being explicitly listed as one of the cultivation goals for English for the first time. This reflects the mental characteristics of core competencies in English, aiming to promote the development of logical, critical, and creative thinking through English teaching activities (Ministry of Education, 2017). Reading instruction is a crucial component of high school English education and an important arena for developing students' thinking qualities.

In English reading instruction, cultivating students' thinking qualities not only helps them deeply understand and analyze texts but also enhances their problem-solving abilities and fosters a habit of lifelong learning. Problem chain design, as a "scaffold" for building new knowledge, aims to promote deep interaction between students and texts, focusing on the development of students' thinking qualities. By designing questions that are directional, related, hierarchical, and appropriate, teachers can guide students to organize text content and uncover deeper meanings, thereby cultivating higher-order thinking skills.

In conclusion, the exploration of designing problem chains to cultivate students' thinking qualities in high school English reading instruction is of great significance. Not only can it foster different aspects of students' thinking qualities through progressively layered questions, but it also provides teachers with a practical teaching method that helps enhance students' English reading comprehension skills. Therefore, this study aims to explore how to effectively apply problem chain design in high school English reading instruction to promote the comprehensive development of students' thinking qualities.

2. Literature Review

The "Ordinary High School English Curriculum Standards (2017 Edition)" emphasizes the importance of logical thinking, critical thinking, and innovative thinking in English learning. Reading classes are key to cultivating students' thinking qualities, and the problem chain, as an innovative teaching strategy, can effectively foster these qualities in reading instruction (Yao He, 2007).

Yao He pointed out that thinking is stimulated by problems,

and the improvement of thinking ability does not happen overnight. It requires a gradual progression from simple to complex, continuously addressing new issues that arise during the problem-solving process. As the importance of cultivating students' thinking qualities through problem chains in reading instruction becomes increasingly evident, many scholars have proposed the necessity of designing problem chains in reading instruction and how to design appropriate problem chains to foster students' thinking qualities.

Hu Wenna analyzed the importance of problem chain design and proposed principles that should be followed in analyzing problem chain design from three aspects: hierarchy, openness, and wholeness. She tested the effectiveness of problem chain design by dividing students into experimental classes and control classes. By designing hierarchical problems in the experimental class, it was found that the design of the problem chain directly impacts students' comprehensive reading ability and improvement in thinking quality (Hu Wenna, 2018).

However, the application of problem chain design in actual teaching is not without challenges. In order to implement the problem chain design more effectively, Wu Ying proposed a new problem chain model. By designing reasonable and scientific introductory problem chain, progressive problem chain and inquiry problem chain, students' different thinking abilities were cultivated in three different stages before reading, during reading and after reading (Wu Ying, 2019).

Meng Cai-na also believes that the three stages before reading, during reading, and after reading should be utilized effectively. She proposes designing display-type, reference-type, and evaluation-type question chains for these stages, which not only help students understand the text content but also guide them in deep information processing and meaning construction. Additionally, this approach can enhance students' analytical and innovative abilities. However, few studies have addressed how to cultivate students' thinking qualities through designing question chains at different levels. Therefore, this study aims to design question chains at different levels from three aspects: learning comprehension, application practice, and transfer innovation, based on the perspective of English learning activities. This is intended to guide students in deep reading while fostering their logical

thinking, critical thinking, and innovative thinking, thereby making the cultivation of thinking qualities more practical in high school English classrooms (Meng Cai-na, 2024).

In addition, foreign scholars have conducted numerous explorations in related fields. Bloom's (Bloom) taxonomy of educational objectives provides a crucial theoretical foundation for problem chain design. He divides cognitive processes into six levels: remembering, understanding, applying, analyzing, evaluating, and creating. This aligns with the layered design concept of problem chains proposed by domestic scholars, emphasizing the gradual guidance of students' thinking towards higher-order development through different levels of problems, helping them construct a complete knowledge system and mental framework.

Domestic studies have also shown that integrating contextual elements into problem chain design can effectively stimulate students' interest in learning, enhance their mental activity, and encourage them to use English to solve practical problems in real-life situations, thereby fostering critical and creative thinking. Combining cooperative learning with problem chain design, through group discussions and the collision of ideas, helps broaden students' perspectives and cultivates logical and critical thinking skills through communication and debate. However, most existing research focuses on theoretical exposition or single-dimensional practical exploration, lacking systematic studies on how to deeply integrate various teaching concepts and methods into problem chain design to comprehensively cultivate students' thinking qualities.

At the same time, with the development of educational informatization, the application of digital tools in problem chain design has gradually become a new research direction. Zhang Min (2024) attempted to use online learning platforms to design dynamic problem chains, adjusting the difficulty and direction of questions based on real-time student feedback, achieving personalized customization of the problem chain. However, in actual teaching, how to balance the application of technology with the essence of teaching, and avoid weakening students' deep-thinking abilities due to over-reliance on technology, still requires further exploration.

In summary, although there have been numerous studies on designing problem chains to cultivate students' thinking qualities, there is still considerable room for research on how to systematically develop these qualities through designing problem chains at different levels that integrate diverse teaching philosophies and technological means. Therefore, this study aims to design problem chains at different levels from the perspective of English learning activities, focusing on three aspects: comprehension, application practice, and transfer innovation. This approach seeks to guide students in deep reading while fostering their logical, critical, and innovative thinking, thereby making the cultivation of thinking qualities a reality in high school English classrooms.

3. Research Content

This study focuses on the core goal of cultivating thinking quality in high school English reading instruction. Based on the perspective of English learning activities, it uses the People's Education Press Book 1 Unit 2 Living Legends as a research vehicle to systematically construct a problem chain at three levels: learning comprehension, application practice, and transfer innovation. By carefully designing and implementing questions at different levels, this study explores pathways for fostering students' logical, critical, and creative

thinking. It aims to provide an operational solution that combines theory with practice for high school English reading instruction, filling the gap in research on cultivating thinking quality through tiered problem chains

3.1. Learning and Understanding Problem Chains

Such questions revolve around the basic information of the text, serving as the foundation for students to construct their understanding of the text. They aim to cultivate fundamental logical thinking skills and lay the groundwork for deeper reflection. When designing these questions, it is important to consider not only conventional dimensions such as text type and character identity but also to integrate knowledge of the English language and text structure analysis for more detailed questioning. For example, adding the question "What are the language features used to describe Lang Ping's and Jordan's achievements?" can guide students to analyze the linguistic features of the text's description of achievements from various angles, such as vocabulary (e.g., the use of positive words) and sentence patterns (e.g., parallelism and emphatic sentences), thereby enhancing their sensitivity to and appreciation of the English language. Another question like "How is the information about the two athletes organized in the text?" can prompt students to organize the text structure, understand the author's logical flow through chronological order and contrastive techniques, thus fostering their ability to integrate information and conduct logical analysis

In terms of teaching strategies, in addition to using the "information labeling" activity, the task of "text mind mapping" can also be introduced. Students work in groups, guided by a problem chain, to create mind maps that include key information and logical relationships from the text, transforming abstract textual content into visual structures to deepen their understanding of the basic content. At the same time, combining Bloom's Taxonomy levels of "memory" and "comprehension," fill-in-the-blank and matching questions can be designed and integrated into the problem chain. For example, matching characters' deeds with corresponding times can reinforce students' memory and understanding of textual details. Additionally, using online document collaboration tools, students can work together to complete text information organization tables, filling in answers related to the problem chain, promoting interaction and cooperation among students, thereby deepening their understanding of the basic content of the text

3.2. Application Practice Problem Chain

Such questions focus on the in-depth interpretation of texts, aiming to transcend surface-level information and guide students to uncover hidden meanings, fostering critical thinking. Beyond contemplating the characters' experiences and evaluations, questions can also be expanded from aspects such as the author's emotional stance, cultural background of the text, and cross-textual comparisons. For example, posing "How does the author's tone reflect his/her attitude towards Lang Ping and Jordan?" encourages students to analyze the emotional connotations of adjectives and adverbs in the text, as well as the tonal characteristics of sentence structures, to infer the author's intentions and develop their skills in textual analysis and critical thinking; setting up "Considering the cultural background when the article was written, how do these two athletes represent the values of that era?" prompts students to consider the historical context of the text, such as

societal admiration for sportsmanship and cultural value orientations, to explore the cultural values embodied by the characters, thereby broadening their depth and breadth of thinking. At the same time, comparative reading is introduced, and other texts about sports figures are selected to ask "Compared with other sports figures' stories, what are the unique aspects of Lang Ping's and Jordan's experiences?" to guide students to deepen their understanding of the text through comparative analysis and cultivate dialectical thinking

In the teaching process, in addition to introducing "role-playing and deep dialogue" activities, "text debates" and "academic essay writing" tasks can also be carried out. For controversial issues such as "Do you think Jordan is a master in his sports and why?", organize students to debate, requiring them to cite textual content as evidence, enhancing critical thinking and language expression skills through the clash of viewpoints; assign academic essay writing tasks, guiding students to focus on core questions in the problem chain, such as "the impact of sportsmanship on personal growth," to research materials, analyze arguments, and practice academic research and logical writing skills. Furthermore, drawing on constructivist theory, create real scenarios like "mock press conferences" and "sports commentary," allowing students to apply textual knowledge to solve practical problems within these contexts, further deepening their understanding and application of the text

3.3. Migration Innovation Problem Chain

This type of question chain is designed based on students' deep understanding of the text, focusing on expanding the connotations of the text's discourse. Such question chains generally do not have definitive answers; students need to form personalized responses by integrating logical thinking, critical thinking, and other skills, thereby cultivating higher-order thinking and enhancing their problem-solving abilities. When designing, perspectives such as character evaluation and case transfer are considered.

When teaching application practice problem chains, debate activities can be introduced. For the question "Do you think Jordan is a master in his sports and why?", divide students into two sides to debate, encouraging them to delve deeper into the text content, analyze the issue from different angles, and enhance their critical thinking and language expression skills

For the innovation chain of migration issues, a "Legendary Figures in Life" sharing session can be organized. When students answer "Who would you choose as another 'living legend' and why?", they need to find examples from their lives and explain them. Teachers can guide students to use mind maps to organize their ideas, further cultivating their innovative thinking and logical organization skills

In addition, during the design of the problem chain, attention should also be paid to the transition and connection between different levels of problems. For example, when transitioning from comprehension questions to application practice questions, guiding questions can be set: "Through our analysis of the text information just now, we have understood the basic situation of the characters. How do these experiences reflect their spiritual qualities?" This naturally guides students into deeper thinking, ensuring the coherence and systematic nature of cognitive development

To further optimize the design of problem chains, diverse teaching theories can be integrated. Drawing on constructivist

theory, situational questions can be set up in the problem chain, such as simulating sports event interviews with Lang Ping and Jordan, allowing students to answer questions from a character's perspective, thereby enhancing their thinking skills in the process of building knowledge. Combining the theory of the Zone of Proximal Development, tiered problem chains can be designed based on students' actual levels. For students with weaker foundations, more hints can be provided for learning comprehension questions, while for those with stronger abilities, the difficulty of transfer and innovation questions can be increased to meet the learning needs of students at different levels

In terms of technology integration, multimedia resources are utilized to assist in problem chain teaching. For comprehension questions, video clips of Lang Ping coaching and Jordan playing are shown, allowing students to answer questions through watching the videos, enhancing their intuitive understanding; for transfer and innovation questions, virtual reality (VR) technology is employed to create immersive scenarios, such as students being placed in a sports museum where they can choose "legendary figures" and explain their reasons, stimulating innovative thinking

At the same time, paying attention to individual differences among students is also a crucial aspect of designing problem chains. Teachers can use pre-class assessments to understand students' English proficiency and thinking characteristics, thereby customizing personalized problem chains for them. For introverted students who struggle with expression, group discussions can be arranged in practical application problems to encourage them to express their views within the group; for more active-minded students, extension tasks can be assigned, such as writing a short paper on "famous figures," guiding them to think deeply and fully utilize their potential

The problem chain design based on three levels of learning understanding, application practice and migration innovation can effectively stimulate students' deep understanding and thinking of the text, and cultivate students' logical, critical and creative thinking from different angles.

4. Research Methods

This study will adopt three research methods: questionnaire survey, interview and classroom observation to collect data from multiple dimensions and comprehensively evaluate the effect of problem chain design on the cultivation of students' thinking quality in high school English reading teaching

4.1. Questionnaire Survey

Design two questionnaires, one for high school English teachers and the other for students. The teacher questionnaire aims to understand teachers' perceptions of English learning activities, their application of problem chain design, and their evaluation of its effectiveness. The student questionnaire is designed to assess students' acceptance of problem chain design, their sense of participation, and its impact on enhancing thinking quality. The questionnaire will include both scale questions and open-ended questions to collect both quantitative and qualitative data

In terms of questionnaire design, the scale questions use a Likert 5-point scoring method. For example, regarding teachers' recognition of the impact of problem chain design on promoting students' thinking quality, five options from "strongly disagree" to "strongly agree" are set; for the frequency of students' participation in problem chain activities, five options from "never" to "always" are provided.

Open-ended questions focus on guiding deeper feedback, such as in the teacher questionnaire: "What is the biggest challenge you encountered when designing the problem chain? How did you solve it?" and in the student questionnaire: "Which problems in the problem chain learning process most stimulate your thinking? Why?"

In the implementation process, a combination of online and offline methods is used to distribute questionnaires. Online distribution is carried out through platforms like Questionnaire Star for convenient and rapid data collection; meanwhile, offline distribution is conducted during English teacher research activities and student classes in some schools to ensure the diversity of samples. After collecting the questionnaires, SPSS software is used for data analysis, including reliability and validity tests, descriptive statistics, and correlation analysis of the scale items, to explore the relationships between variables; open-ended questions are coded and analyzed thematically to extract key insights

4.2. Interview

Based on the questionnaire survey, some teachers and students were selected for in-depth interviews. The interviews will be conducted in a semi-structured format to explore specific practices, challenges encountered, and solutions when teachers implement problem chain design, as well as the thought processes and learning experiences of students participating in problem chain activities. The interviews will also cover both parties' views on the effectiveness of problem chain design and suggestions for improvement.

Develop a detailed interview outline, designing questions for teachers such as "How do you adjust the question chain design in different reading classes (such as intensive reading or extensive reading)?" and "How do you optimize the question chain based on real-time classroom feedback?" For students, design questions like "When faced with difficult questions, how do you think and attempt to solve them?" and "Has learning through the question chain changed your reading habits? In what ways?"

During the interview, use a voice recorder to record the entire session and take notes on-site to document the interviewee's tone, expressions, and other non-verbal information, which aids in understanding the content of the interview. After the interview, promptly convert the recorded content into written transcripts and use NVivo software for qualitative analysis. Through coding and clustering, identify key information to form thematic threads and compare the differences in viewpoints among different teachers and students

4.3. Classroom Observation

In actual teaching, systematic observations will be conducted in the classroom. The focus of the observation will be on how teachers organize problem chain activities, guide student thinking and discussions, and how students demonstrate their thinking qualities such as critical thinking, creative thinking, and problem-solving skills during these activities. Observation records will combine notes with audio recordings to ensure the completeness and accuracy of the data

Design a specialized classroom observation checklist to observe from two dimensions: teacher behavior and student performance. The teacher behavior dimension includes indicators such as the presentation of problem chains, problem-guiding strategies, and classroom interaction

patterns; the student performance dimension includes indicators such as participation, depth and innovation in answering questions, and contributions to group thinking. Each indicator is set with specific observation points and evaluation criteria

Using a combination of video recording and on-site observation, in addition to audio recording, high-definition cameras are used to capture the entire class process for subsequent review and analysis. Subject experts and frontline core teachers are invited to form an observation team to conduct multiple rounds and multi-angle classroom observations, reducing personal subjective bias. Classroom observation and analysis software, such as Classroom Analysis, is utilized to code and analyze video data, quantifying teacher-student interaction frequency, student engagement duration, and other metrics. Combined with qualitative observation records, this approach comprehensively evaluates the effectiveness of problem-based teaching

Through the comprehensive application of these three research methods, this study will be able to comprehensively analyze and evaluate the implementation effect of problem chain design in high school English reading teaching, as well as the impact on the cultivation of students' thinking quality, and provide data support and theoretical basis for subsequent teaching practice and research

5. Conclusion

This study delves into the cultivation of students' thinking qualities in high school English reading instruction through problem chain design. Based on the perspective of English learning activities, using the People's Education Edition Book 1 Unit 2 Living Legends as an example, it constructs a three-tier problem chain system for learning comprehension, application practice, and transfer innovation. Through various research methods such as questionnaires, interviews, and classroom observations, its teaching effectiveness is systematically evaluated. The study shows that layered problem chain design can effectively guide students from basic text information understanding to deep interpretation and innovative application. In the learning comprehension category, it solidifies logical thinking foundations; in the application practice category, it deepens critical thinking; and in the transfer innovation category, it stimulates creative thinking. This provides a practical path for the comprehensive development of students' thinking qualities

In terms of teaching practice, the problem chain design strategy proposed in this study is organically combined with classroom activities, such as text mind mapping and simulated press conferences, providing an operational model for high school English teachers to conduct reading instruction. At the same time, integrating diverse teaching theories into problem chain design and using digital tools to achieve personalized teaching not only enriches the methodological system of English reading instruction but also offers new ideas and directions for cultivating thinking quality, a core competency in the English discipline. This has positive practical significance for advancing reforms in high school English reading instruction.

References

- [1] Fang Juping. (2023). Research on the Application of Problem Chain Teaching Mode in High School English Reading

- Teaching under the Background of "Double Reduction" Examination Weekly, (05),111-114.
- [2] Guo Yifei. The Application of Problem Chain in Junior High School English Reading Teaching [J]. Foreign Language Teaching in Primary and Secondary Schools (Middle School Edition), 2019, 42 (10): 61-65.
 - [3] Hou Peng.(2019). An Example Discussion on the Application of Problem Chains Based on the View of English Learning Activities in the Teaching Design of High School English Reading. Middle School English, (26),114.
 - [4] Hu Wenna. Problem Chain Design in Junior High School English Reading Teaching Based on the Cultivation of Thinking Quality [J]. English Teacher, 2018, 18 (07): 135-140.
 - [5] Ministry of Education. English Curriculum Standards for General Senior High Schools (2017 Edition)[M]. Beijing: People's Education Press, 2017.
 - [6] Meng Caina. The Application of Problem Chain in Junior High School English Reading Teaching [J]. Reading, Writing and Arithmetic, 2024, (13): 89-91.
 - [7] Pei Song.(2011). The Application of Problem Chain in High School English Reading Teaching. Journal of the School of Foreign Languages, Shandong Normal University (Basic English Education),13(06),75-79.
 - [8] Sha Sha.(2024). Research on the Design and Application of Problem Chain in High School English Reading Teaching Based on the Cultivation of Thinking Quality. English Teacher, 24(02),23-25.
 - [9] Wang Fang.(2022). Application of the View of Diagnostic Assessment English Learning Activities in the Design of Problem Chains for High School English Reading Teaching - Foreign Language Teaching Edition English Elective 6 Module 3 Interpersonal Relationships - Friendship Reading Class Roy's Take Story as an example. Middle School English, (16),44-46.
 - [10] Wu Ying. Design of Problem Chain for Junior High School English Reading Class Based on Developmental Thinking Quality [J]. Basic Foreign Language Education, 2019, 21 (04): 83-88+108.
 - [11] Yao He. About "the problem" and the "chain" [J]. Journal of curriculum teaching and research (in teaching research), 2007, (Z2): 13 to 15.