# Path Construction of High School English Reading Instruction Based on "Problem Chain Plus Thinking Visualization"

Wanying Zhang[1] Zhuo Li[2]

[1,2] *Jilin International Studies University, Changchun, Jinlin 130177, China*

## ABSTRACT

"Problem chain" and "thinking visualization tools" are important means to cultivate students' thinking abilities in high school English reading teaching. In the teaching of high school English reading, teachers should construct a learning path based on the integration of "problem chain plus thinking visualization". Through the PWP reading teaching mode commonly used by English teachers, teachers need to help students understand the basic information of the text, deeply interpret the content, language characteristics and logic, comprehend the writer's writing intention and values, and visualize the implicit thinking process, so as to achieve a deep integration of language and thinking, and promote the improvement of students' core English subject literacy.

*Keywords: Problem chain, Thinking visualization, Reading instruction.*

## 1. INTRODUCTION

The 2017 edition of the "English Curriculum Standards for Ordinary High Schools" states: "The relationship between language and thinking is very close, and learning and using language requires the use of thinking. At the same time, learning and using language can further promote the development of thinking." [1] The quality of thinking is an important component of the core competencies of high school English subject, which is clearly included in the curriculum objectives of the English subject, which is a challenge for English teachers. [2] As one of the main courses in English teaching, reading class is the main way to cultivate students' core academic literacy and has a certain educational function. However, the current reading instruction has accumulated drawbacks, such as fragmented text information, fragmented text structure, rigid teaching mode, low level of thinking, and utilitarianism in following exam questions. Teachers almost completely focus on the language learning of texts, neglecting the cultivation of students' thinking qualities and the exercise of their thinking abilities. In daily teaching, questioning is relatively casual and cannot truly guide students to think from the outside to the inside, from the shallow to the deep. The design of teaching activities lacks relevance, hierarchy, and logic.

In view of this, this study explores the teaching path of high school English reading based on "problem chain plus thinking visualization", aiming to discover how to use problem chain as the driving force and appropriate thinking visualization tools to make students' thinking methods, thinking content, and thinking results hierarchical, connected, and generative, in order to further integrate language and thinking, and improve students' core English subject literacy.

## 2. CONCEPT DEFINITION

There are two key concepts involved in this paper, namely "problem chain" and "thinking visualization". The following is the scholars' definition of these two concepts.

### 2.1 Problem Chain

Problem chain is one of the commonly used teaching strategies for teachers to guide students in text reading and develop their thinking qualities. The design of the problem chain is for teachers to

transform textbook knowledge into a series of systematic and hierarchical teaching problems based on students' existing knowledge and experience, teaching objectives and content, as well as the confusion or potential confusion that students may encounter during the learning process. [4] The first problem in the problem chain is usually the premise and groundwork for the second problem, while the second problem is the ladder of the third problem, which progresses layer by layer and is interconnected.[5]

## 2.2 Thinking Visualization

Tishman & Palmer first proposed the concept of thinking visualization, which refers to recording the problems and thinking processes of a group or individual in any observable form [6]. Later, Liu Zhuoyuan believed that thinking visualization refers to the process of presenting previously hidden and invisible thinking structures, patterns, paths, and methods through diagrams or combinations of diagrams, making them explicit and clear. [7]

## 3. THEORETICAL SUPPORT

This part analyzes the theoretical support of high school English reading teaching based on "problem chain plus thinking visualization", so as to make the construction of teaching mode and teaching design more effective. Its theoretical support includes Bloom's cognitive goal classification theory and constructivism theory.

## 3.1 Bloom's Cognitive Goal Classification Theory

Bloom divides educational goals into two dimensions, namely the knowledge dimension and the cognitive process dimension, and divides the cognitive process into six levels (as shown in "Figure 1"). This theory suggests that in the teaching process, teachers should ask questions from low to high difficulty questions, gradually and from the surface to the inside, in order to guide students' thinking level from low to high. In the process of setting up the problem chain, this study followed this theory and divided the problem into five types: introductory, exploratory, constructive, argumentative, and innovative. In actual high school English reading teaching, presenting five types of questions to students in sequence not only conforms to their cognitive rules, but also enables them to deeply understand the text and promote the development of higher-order thinking.
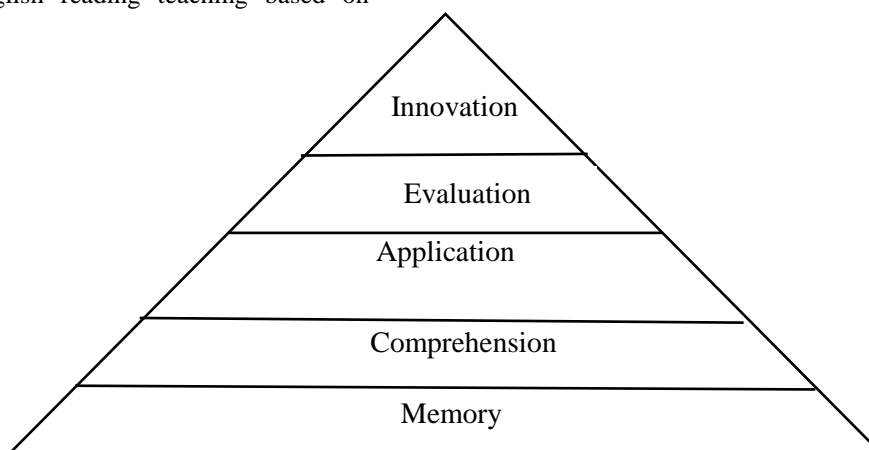


Figure 1 Bloom's cognitive process classification.

## 3.2 Constructivism Theory

Constructivism theory believes that the process of learning is the process of learners generating meaning and constructing new knowledge based on their existing knowledge and experience. Both "problem chain" and "thinking visualization" have constructivist attributes. The application of "problem chain" and "thinking visualization" can make English teaching content logical and structured, as well as have a high "thinking content". It respects students' existing cognition, accurately identifies the nearest development area, and locates the best thinking development point for different students, which enables students to effectively understand and accept textual information and connotation. The application of "problem chain plus thinking visualization" fully reflects the three major constructivist characteristics of "learner control", "active participation", and "creative generation".

## 4. CONSTRUCTING A HIGH SCHOOL ENGLISH PWP READING INSTRUCTION MODEL BASED ON "PROBLEM CHAIN PLUS THINKING VISUALIZATION"

The purpose of this study is to construct a high school English PWP reading teaching model based on "problem chain plus thinking visualization", with the aim of exploring the theme meaning of high school English reading (as shown in "Figure 2"). The PWP reading teaching model is a commonly adopted English reading teaching model by English teachers, which divides reading teaching into three stages: pre-reading, while-reading, and post-reading. In its three main teaching stages, utilizing the driving force provided by the problem chain, teachers, students, and students are encouraged to collaborate and deepen multi-dimensional and multi-level text interpretation. In this process, thinking visualization tools are appropriately used to promote students to transform complex plots and scattered language into logical, hierarchical, and concise thinking maps in the process of interpreting the theme meaning of the text, thus activating students' critical thinking, innovative thinking, and logical thinking.
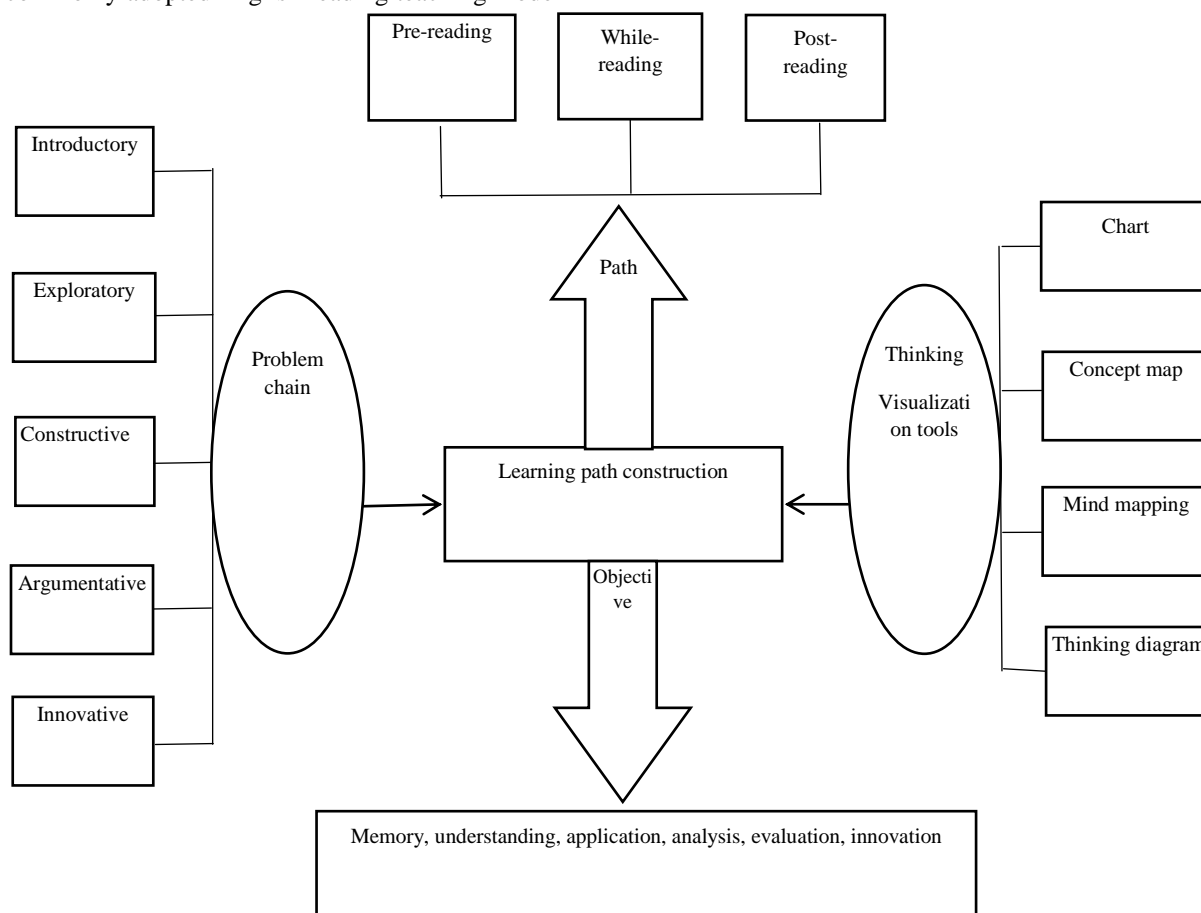


Figure 2 High school English PWP reading instruction model based on "problem chain plus thinking visualization".

## 5. OPTIMIZING QUESTION DESIGN AND STIMULATING EFFECTIVE DRIVING FORCE FOR THINKING DEVELOPMENT

Learning arises from contemplation, contemplation rises from doubt, and doubt lies in asking. Questions are the starting point for the development of thinking, and to stimulate students' thinking through doubts, it is necessary to design questions that are linked one by one, layer by layer, to stimulate and promote their thinking. Therefore, high school English teachers need to design problem chains that are hierarchical, logical, relevant, flexible, and generative, helping students firmly grasp the overall perspective of text

interpretation, enabling them to achieve a ladder like climb in English learning, as well as the logical and thinking nature of pragmatic expression. This study divides the problem types into five types (see "Table 1").

Table 1. Effective integration of teaching links and "problem chain"

| Teaching links | Problem type | Problem chain hierarchy | Design intent |
|---|---|---|---|
| Pre-reading | Introductory | Review, correlation, perception, prediction, reasoning | Activate students' existing knowledge and experience, laying the groundwork for the theme content. |
| While-Reading | Exploratory Constructive Argumentative | Search, analysis, reasoning, interpretation, comparison, integration, summarization | Explore the thematic significance of the text, deeply interpret its connotation, and construct structured knowledge |
| Post-reading | Innovative | Evaluation, application, innovation | Guide students to connect with real-life situations, apply them to real situations, and constantly innovate |

Using thinking visualization tools, such as the eight great thinking diagram, mind mapping, and concept map, it can clearly display the key information and thinking paths of the text (as shown in "Figure 3").
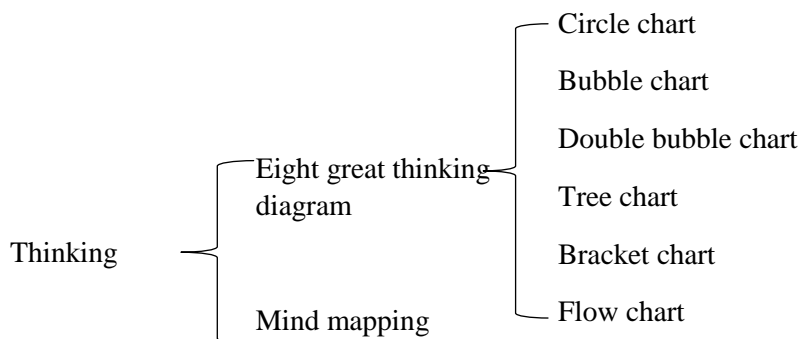


Figure 3 Classification of thinking visualization tools.

"Thinking visualization" can enable students to grasp the overall perspective of text interpretation, transform implicit thinking into explicit thinking, systematically extract scattered knowledge from discourse, and shift the focus of English reading teaching from the" information layer "to the" cognitive layer ". High school English teachers should use effective and appropriate thinking visualization tools to guide students in the process of understanding discourse information, understanding the meaning of the text, and then internalizing their personal cognition. The understanding of discourse information guides students to understand the basic information, logical framework, and language characteristics of the discourse, and to conduct in-depth analysis and interpretation of the discourse. The understanding of the connotation of the text guides students to understand the author's writing intention, inner emotions, and implicit meanings, enabling them to deeply understand the language, culture, and background of the text. The internalization of students' personal cognition refers to the construction of self-awareness, the production of self-awareness, and the reconstruction of their own outlook on life, values, and worldview after

understanding the basic information, connotations, and values of the discourse.

In view of this, in the process of teaching high school English reading, teachers should use problem chain to help students create a thinking field, accurately capture thinking nodes, climb thinking slopes, and clarify the logic of the text to construct a self-thinking structure (as shown in "Figure 4").

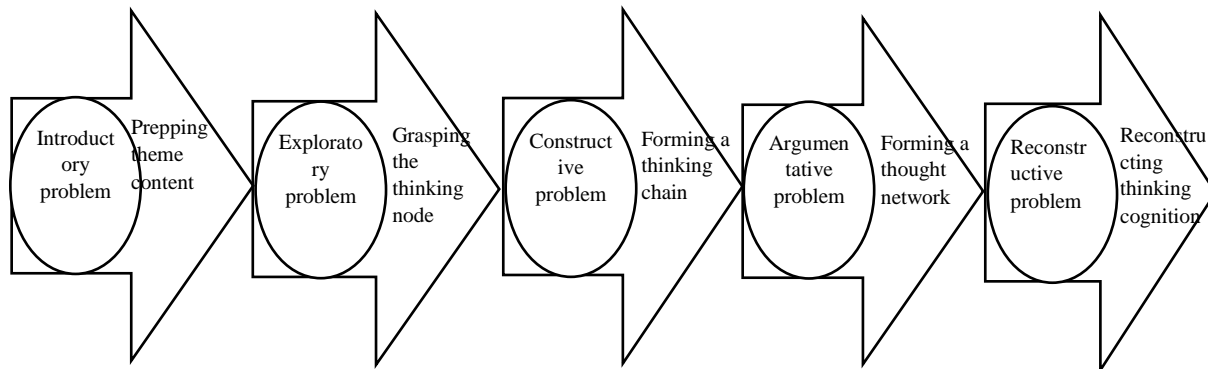| Introductory problem | Prepping theme content | Exploratory problem | Grasping the thinking node | Constructive problem | Forming a thinking chain | Argumentative problem | Forming a thought network | Reconstructive problem | Reconstructing thinking cognition |

Figure 4 "Problem chain plus thinking visualization" promotes a continuous rise in the slope of thinking.

Different types of problems provide different driving forces for students' thinking development. Introductory questions can stimulate students to quickly focus on the topic, laying the groundwork for understanding the content of the topic; Exploratory questions can guide students to grasp the thinking points and understand the basic information and structure of the text; Constructive questions can help students form a thinking chain and grasp the characteristics and structure of text language; argumentative thinking can stimulate students' dialectical thinking, understand and analyze the author's emotions and viewpoints; Innovative questions can lead students to unleash their innovative thinking and even reconstruct their own values.

## 6. CONSTRUCTING A DUAL DIMENSIONAL INTEGRATION OF " PROBLEM CHAIN PLUS THINKING VISUALIZATION" IN HIGH SCHOOL ENGLISH READING INSTRUCTION PATH

It is necessary to utilize the driving force of the problem chain to promote students' thinking activities such as perception, reasoning, evaluation, and innovation. At the same time, by effectively utilizing thinking visualization tools, it not only helps teachers understand students' thinking states, but also promotes the development of students' higher-order thinking abilities, making them become explorers of textual meaning and knowledge builders. ("Table 2")

Table 2. High School English Reading Teaching Path Based on the Dual Dimensional Integration of "Problem Chain plus Thinking Visualization Tools"

| Teaching links | Problem chain | Thinking visualization tools | Development of thinking ability |
|---|---|---|---|
| Pre-reading | Using lead-in questions to focus students on topics and develop associations | Using KWL tables, tree charts, bubble charts, etc. to awaken students' existing knowledge and experience, laying the foundation for the theme content | Prediction, divergence |
| While-reading | Using exploratory questions to help students clarify the logic of the text | Using thought diagrams that match the content of the text to make the logical structure of the text clear and visualized, such as bubble chart, tree chart, and flow chart | Understanding, analysis, reasoning, comparison |
| | Using constructive questions to help students understand the language characteristics of the text and extract important information | Using concept maps to guide students to clarify the language context and characteristics of the text, such as Wayne diagrams, fishbone diagrams, etc | Interpretation and induction |
| | Using argumentative questions to enable students to analyze the author's writing intention and values | Using charts to guide students to deeply experience the author's emotions, background culture, etc | Summarization, integration, internalization |
| Post-reading | Using innovative questions to help students reconstruct their own values and cognitive perspectives based on real-life situations | Using parentheses, bubble charts, etc., guide students to reconstruct their self-awareness and fully express their ideas and viewpoints | Evaluation, application, innovation |

## 7. TEACHING DESIGN CASES AND TEACHING PATHS

Taking "First Impressions" as an example, the People's Education Press High School English Compulsory One explains the application of the dual dimensional integration path of "problem chain plus thinking visualization" in high school English reading teaching.

### 7.1 Text Interpretation

[What] Text content. This article mainly discusses Han Jing's first day of high school life. At the beginning, she was a bit anxious and hoped to leave a good first impression on her classmates and teachers. In the first math class, she felt that although it was a bit difficult, the teachers and classmates were very friendly. In the afternoon chemistry class, she hoped no classmates disturb her listening. Looking back on this day at home at night, she felt confident and looked forward to tomorrow.

[Why] Theme significance. This article tells students to have the courage to face challenges in life, be good at expressing their emotions, and have the courage to accept and adapt to new life.

[How] Text interpretation. This article is written in chronological order throughout the day, with a total of four time points, which are also the author's four emotional points. At 7:00 am, the author developed a bit of anxiety due to wanting to leave a good first impression on everyone. At 12:30 pm in the first math class, the author felt that although it was a bit difficult, the teacher was very humorous

and the classmates were very friendly. At 5:32 pm in the chemistry laboratory, the author met a classmate who had an impact on his listening and hoped that he would calm down. At 10:29 pm, the author summarized his feelings for the day, from panic to confidence, and hoped to explore bravely and look forward to tomorrow.
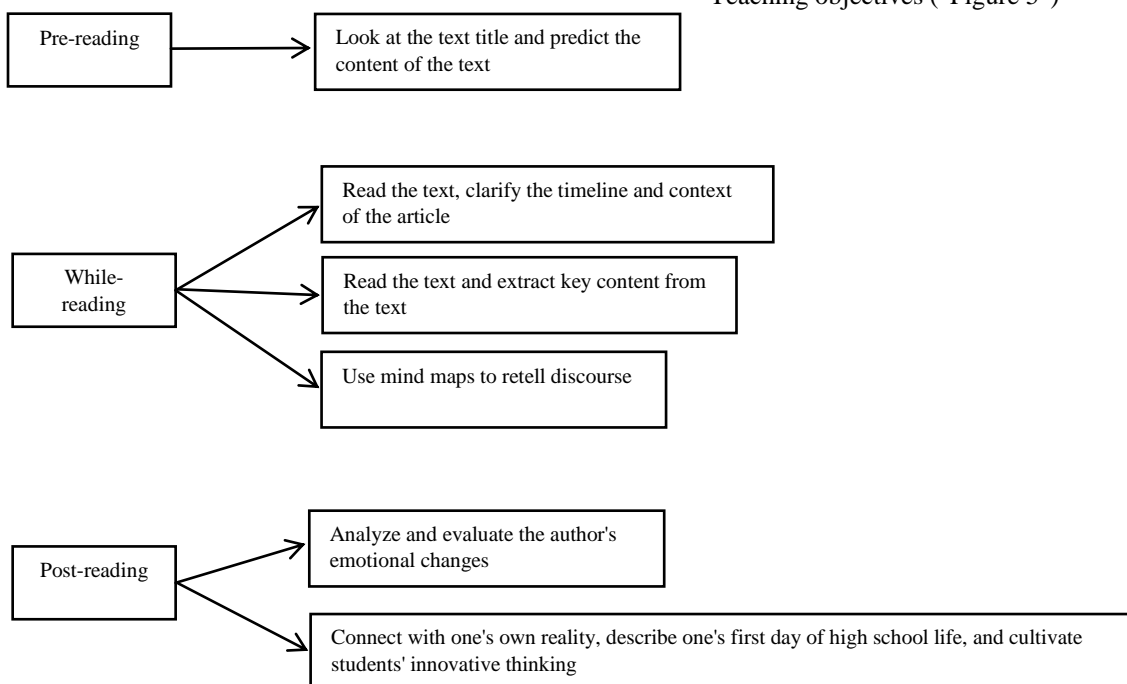
- Teaching objectives ("Figure 5")

Pre-reading → Look at the text title and predict the content of the text

While-reading →
- Read the text, clarify the timeline and context of the article
- Read the text and extract key content from the text
- Use mind maps to retell discourse

Post-reading →
- Analyze and evaluate the author's emotional changes
- Connect with one's own reality, describe one's first day of high school life, and cultivate students' innovative thinking

Figure 5 Teaching objectives of "First Impressions" for High School English Compulsory One.

- Teaching design ideas (as shown in "Figure 6")

Pre-reading

Activate students' existing knowledge and experience

While-reading

Sort out the context of the article

Pay attention to the vocabulary and sentence patterns used by the author to describe their emotional changes

Post-reading

Combine real-life situations, guide students to reflect on their emotional changes after entering high school, encourage students to adapt to new environments and accept new challenges
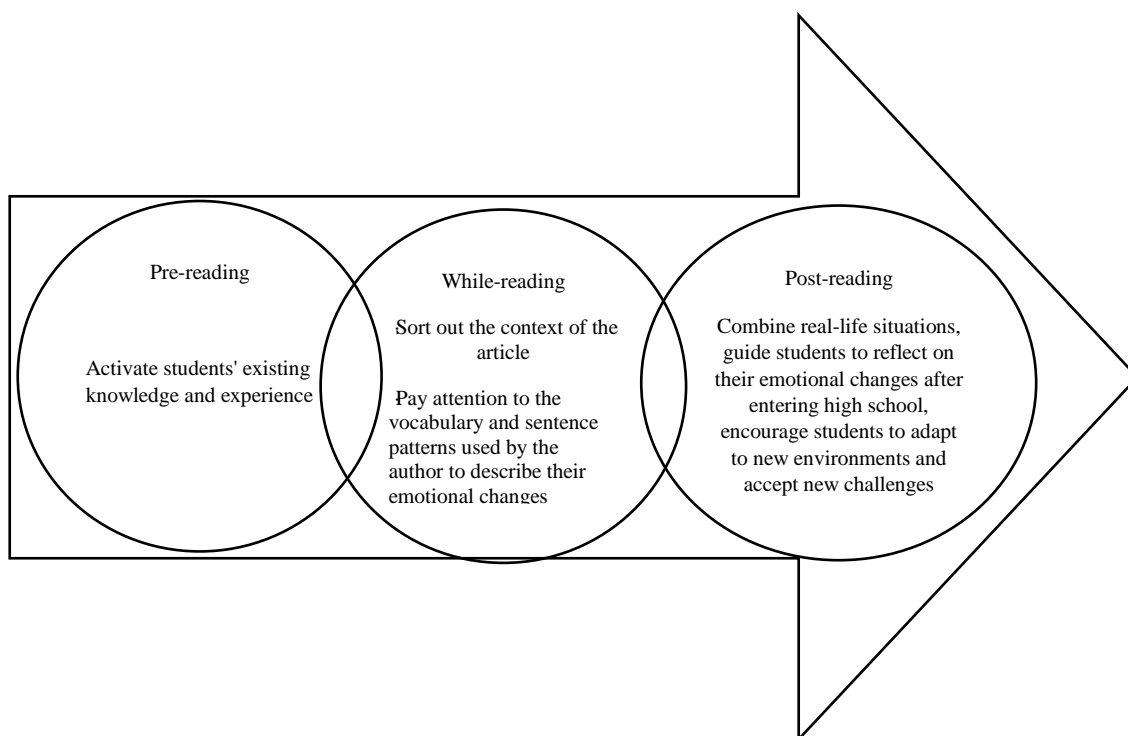
Figure 6 Teaching design ideas for High School English Compulsory One "First Impressions".

### 7.2 Implementation of Teaching Paths

Pre-reading: the teacher guides students to review existing knowledge, predict text content, and establish connections between new and old knowledge by designing problem chains. In this lesson, the teacher uses problem chains to activate students' existing knowledge and experience, enable them to access knowledge links, encourage them to brainstorm and associate as many words as possible to represent emotions, and stimulate students' enthusiasm for exploration.

- Problem chain: introductory problems

Question 1: Hey guys ,today we are going to appreciate a diary about Han Jing's first day of senior high school .You can try to memorize, how did you feel on your first day of junior high school?

Question 2: Try your best to give me some words to describe how you felt on your first day of junior high school?

Question 3: Do you remember something that change your feelings on your first day of junior high school?

- Thinking visualization tool: bubble chart (as shown in "Figure 7")

The teacher guides students to focus on the theme "First day of senior high school" and say as many words as possible that can express emotions, in order to cultivate students' divergent and related thinking.
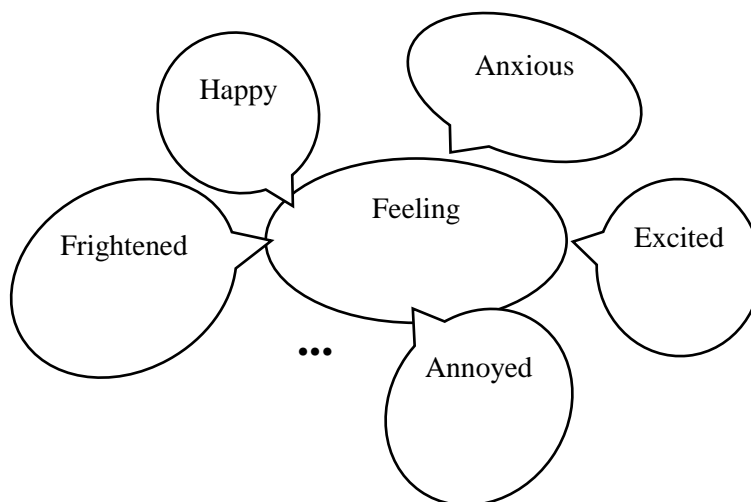


Figure 7 Bubble chart of words expressing emotions.

While-reading: teachers use exploratory and constructive questions to guide students to explore the author's emotional changes, the reasons for Han Jing's anxiety before attending school, her feelings in her first math class, and what happened in chemistry class. Driven by the problem chain, students can interpret the meaning of the text from shallow to deep. Teachers use argumentative questions to encourage students to speculate, analyze, and summarize the author's writing intention and values, in order to internalize students' understanding of the thematic meaning of the text. Teachers should guide the students to think about what Han Jing learned from her first day of high school, so as to help students summarize the thematic significance of the text, that is, being brave in adapting to new environments, being good at expressing emotions, and daring to face challenges.

- Problem chain: exploratory and constructive

Question 1: Why did Han Jing feel anxious before school?

Question 2: How was her first maths class?

Question 3: What happened in the chemistry class?

- Problem chain: argumentative questions

- What did Han Jing learn from her first day at senior high school?

- Thinking visualization tools: fishbone diagram (as shown in "Figure 8")

The fishbone diagram can clearly display the contrastive discourse content. Based on the construction of the fishbone diagram, students can have a clearer understanding of the timeline of the

text and Han Jing's experiences and corresponding emotions at the four time nodes, clarify the language structure, grasp the language characteristics, and finally form a concept and cognition about the theme of the text. It is necessary to cultivate students' thinking abilities such as analysis, reasoning, interpretation, and induction.



| A little anxious 7:00 a.m. | Kind and friendly 12:30p.m. | Friendly and helpful 12:30p.m. |

Anxious

Han Jing's feelings on her first school day

Confident

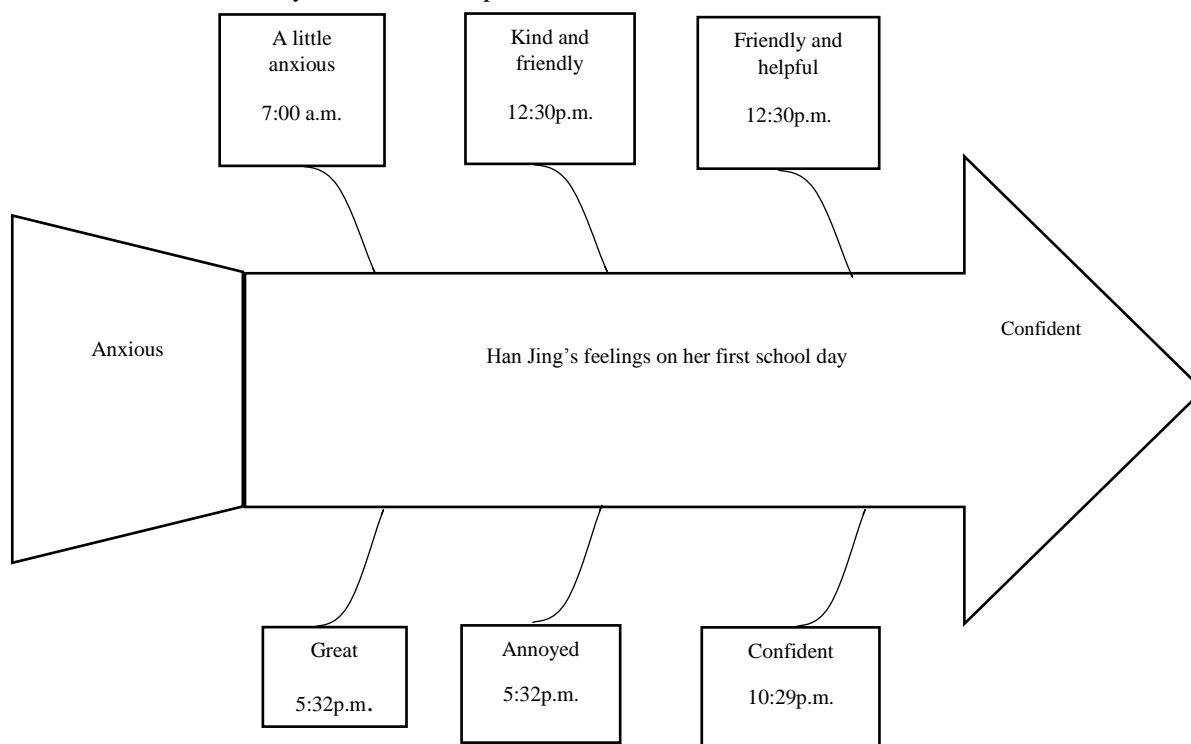| Great 5:32p.m. | Annoyed 5:32p.m. | Confident 10:29p.m. |

Figure 8 Fishbone diagram to help clarify discourse timeline.

Post-reading: Teachers use innovative questions to guide students to imagine, evaluate, and create text plots and the author's problem-solving methods in conjunction with their own real-life situations, and express their own views and attitudes, thereby reconstructing their cognition and cultivating students' innovative thinking. This discourse can be designed to allow students to express their own opinions on the emotional changes and interesting events of their first day of high school life, or if they are the author, how they cope with your emotional changes and what happened on the first day of school.

• Problem chain: creative problem

Question 1: If you feel anxious before school, what would you do?

Question 2: If you think the maths class is difficult, what would you do?

Question 3: If you are Han Jing ,the guy next you talk to you in chemistry class, what would you do?

• Visualization tool for thinking: charts (as shown in "Table 3")

Charts can help students form blocks of information in their own minds, obtain key information more intuitively, clarify their thinking, and thus reconstruct their cognition.

Table 3. Guiding the reconstruction of cognition

| Before school | First maths class | In the science lab |
|---|---|---|
| If you feel anxious before school, what would you do? | If you think the maths class is difficult, what would you do? | If you are Han Jing ,the guy next you talk to you in chemistry class, what would you do? |
| If we feel anxious before school we'd better... | ... | ... |

## 8. CONCLUSION

This study focuses on the thematic meaning of the discourse, consciously transforms students' implicit thinking into explicit thinking based on "problem chain plus thinking visualization", and improves students' thinking quality and ability to interpret texts. However, there are still many shortcomings in this study, such as the need to improve the logic and coherence between various problems in problem chain design, and the pertinence and details of thinking visualization tool design still need to be improved. The author hopes to work together with all researchers to make the "problem chain plus thinking visualization" play a more positive role in high school English reading teaching.

## ACKNOWLEDGMENTS

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