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Application and Practice of Thinking Visualization in Senior High School English Reading Teaching

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Abstract

To address the challenges implicit thinking processes, superficial comprehension, and disconnection between linguistic competence and thinking quality cultivation among students in senior high school English reading teaching, thinking visualization provides an effective solution. This method converts abstract information processing, logical connections, and structural analysis in reading comprehension into intuitive graphics via diverse visual tools. Teachers should flexibly apply various visualization tools throughout all stages of reading teaching, guiding students to systematically sort out texts, analyze logical relations, compare viewpoints, and transfer and apply knowledge. Combined with concrete teaching cases, this paper analyzes the feasibility of applying thinking visualization tools to senior high school English reading teaching, aiming to offer a new perspective for reading instruction.

Keywords

Thinking Visualization; Senior High School English; Reading Teaching; Practical Path

1. Introduction

Driven by globalization and the core competency orientation of the new curriculum standard, senior high school English reading teaching is no longer confined to simply imparting linguistic knowledge and learning strategies. Instead, it places greater emphasis on fostering students' cultural awareness, thinking quality, and lifelong learning abilities. As a core channel for language input and intellectual engagement, reading grows increasingly vital. Nevertheless, traditional reading teaching practice faces intractable difficulties:

First, text interpretation remains opaque. Students merely extract surface-level information, while their higher-order thinking activities such as reasoning, analysis, evaluation and critical reflection can hardly be stimulated or guided effectively. Consequently, teachers struggle to accurately diagnose students' cognitive barriers.

Second, teaching approaches fail to fully meet students' cognitive demands. Faced

with increasingly complex discourse structures and abstract cultural concepts, most classrooms still rely primarily on verbal explanation and fragmented exercises, lacking scaffolds to concretize abstract thinking and help students build systematic understanding.

Third, the cultivation of linguistic competence and thinking quality is often separated. Teachers lack effective strategies to integrate the acquisition of linguistic knowledge, exploration of textual meaning, and improvement of thinking capacity. As a result, students fail to conduct in-depth thinking during language use and cannot develop critical or creative thinking.

Against this backdrop, Thinking Visualization stands out as a transformative approach to advance senior high school English reading teaching. It adopts visual cognitive tools including mind maps, concept maps and flowcharts to externalize students' implicit, abstract reading processes (such as information screening, logical association and structural grasping) into clear graphical symbols. This not only reduces students' cognitive load but also visualizes their thinking paths for mutual review and optimization between teachers and students. In short, researching the practical path of thinking visualization in senior high school English reading teaching resolves the dilemma that thinking cultivation cannot be intuitively demonstrated. It offers robust support for constructing efficient English reading classes centered on thinking development and deep comprehension, facilitating a profound shift in reading teaching from "knowledge transmission" to "thinking empowerment".

2. Overview of Thinking Visualization

2.1. Definition of Thinking Visualization

Overseas scholars Tishman & Palmer (2005) defined thinking visualization as the observable documentation of individual or collective thought, reasoning, questioning and reflection. Salmon (2008) pointed out that thinking visualization differs from mere externalization; it serves as a pathway to make thinking explicit. Through language, writing, drawing or architectural design, it presents the content and process of thought, enabling observation, analysis and reflection to refine thinking strategies continuously.

Domestic scholar Liu Zhuyuan (2014) first proposed and defined the concept of "Thinking Visualization": a series of images that render unobservable thinking content, knowledge frameworks and skills clear and accessible. Zhao Guoqing et al. (2018) argued that the essence of visualization lies in catalyzing knowledge generation and communication, with its greatest value lying in revealing the intrinsic nature of associated concepts. Zuo Bowen and Zhou Lijun (2020) held that thinking visualization refers to the logical presentation of thinking processes through dedicated thinking tools.

In summary, thinking visualization acts as an effective teaching and learning

instrument that helps teachers and learners analyze and express complex thinking processes. By translating abstract thought into concrete, intuitive graphics, students can clearly grasp the internal logic and structure of knowledge to facilitate deep learning. Meanwhile, teachers can leverage visualization to better guide students' intellectual development and boost teaching effectiveness. Therefore, thinking visualization boasts broad application prospects in education and merits further research and promotion.

2.2. Thinking Visualization Tools

Salmon (2008) defined thinking visualization tools as graphic instruments that concertize abstract thought. Zhao Guoqing et al. (2018) categorized them as core thinking tools, including eight thinking maps, concept maps and mind maps. Xia Wei (2021) stated that such tools present verbal knowledge and text via visual representations. The three most representative visualization tools are concept maps, thinking maps and mind maps. Major tools are elaborated below:

2.2.1. Mind Map

Proposed by British psychologist Tony Buzan in the 1970s, a mind map is a graphical tool for visualizing thought and organizing information, designed to streamline idea sorting, memory retention and problem-solving. Centered on a core theme, it adopts a radial branching structure to display relevant ideas, concepts and keywords. With only one fundamental form, it mimics the associative thinking patterns of the human brain, making it an intuitive, efficient instrument for expressing divergent thought.

2.2.2. Concept Map

Developed by Joseph Novak of Cornell University based on Ausubel's theory of meaningful learning, a concept map uses nodes to represent concepts and connecting lines with linking words to denote their relationships. Its key characteristics include: First, each node may correspond to multiple parent nodes. Second, concepts are arranged hierarchically, with the broadest, most general concepts at the top and more specific, narrower concepts listed below.

2.2.3. Eight Thinking Maps

Also known as thinking maps, they were created by Dr. David Hyerle of the United States as visual learning aids grounded in cognitive psychology and semantics. Consisting of eight distinct graphical elements, each corresponds to a unique mode of thought for definition, analysis, narration, explanation, ranking, comparison, classification and analogy. Widely used types include: Brace Map (Illustrates whole-part relationships),Tree Map (For grouping and categorization),Bubble Map (Describes the attributes of a single subject), Double Bubble Map (Compares

similarities and differences between two subjects), Bridge Map (Facilitates analogical reasoning), Flow Map (Shows chronological sequences and developmental stages of events), Multi-Flow Map (Clarifies causal relationships and outcomes).

These representative visualization tools convert complex information into intuitive visuals through graphical representation. They help learners identify patterns and regularities within information while promoting communication and collaboration among peers.

3. Theoretical Foundations of Thinking Visualization Teaching

3.1. Constructivism

Constructivism posits that knowledge is not passively received but actively constructed by learners based on personal experience. It encourages students to independently explore new knowledge and integrate it into their existing knowledge systems. In English reading, students autonomously drawing mind maps to summarize text outlines or creating concept maps to connect new vocabulary with background knowledge represents active meaning construction. Learners must screen, organize and associate information to externalize implicit thinking into visible graphical symbols. This deepens text comprehension and fosters meta-cognition (reflection on personal comprehension strategies) and critical thinking. Additionally, collaborative creation of visual charts in groups further promotes peer communication and teamwork.

3.2. Dual Coding Theory

Proposed by psychologist Allan Paivio in 1969, the Dual Coding Theory contends that humans process information through two independent yet interactive cognitive systems: the verbal system (handling linguistic information) and the nonverbal system (processing imagery such as pictures). Information presented simultaneously through both systems (text paired with images) is easier to comprehend and memorize than information delivered via language alone.

In English reading teaching, thinking visualization tools (e.g., pictures for vocabulary memorization, mind maps to sort main ideas and paragraph logic) provide intuitive visual representations for abstract written text. This multi-modal integration of graphics and language significantly reduces the cognitive load of processing pure text, helps students grasp textual content more thoroughly, and strengthens retention of key information and discourse structures.

4. Practical Application of Thinking Visualization in Senior High School English Reading Teaching

Senior high school students exhibit substantial advancement in both the breadth and depth of their thinking. Thinking visualization converts reading content across

pre-reading, while-reading and post-reading stages into graphics and images, rendering abstract reading materials concrete. This aligns with students' cognitive development laws and deepens their understanding of texts.

During instruction, teachers should select appropriate visualization tools matching reading content and students' cognitive characteristics and integrate visualization into all reading phases. This makes reading content visually accessible, replacing monotonous blackboard notes of isolated words and phrases. Combining graphics with textbooks boosts students' reading motivation and enhances their reading proficiency. Taking Just a Brother from Module 3, Compulsory 1 of Foreign Language Teaching and Research Press Senior High English textbook as an example, this paper elaborates the implementation of thinking visualization in reading classes.

4.1. Lead-in Stage: Double Bubble Map

The teacher displays photos of Olympic medal podiums and brothers supporting each other, then poses a controversial question: If your teammate falls close to the finish line during a race, will you stop to help or keep running for victory? Students vote by raising or withholding their hands. Next, the teacher distributes a blank double bubble map template (Figure 1), labeling the left bubble cluster Winning the Race and the right cluster Helping Family. Students work in groups to fill characteristic keywords: the left side includes glory, rules; the right side includes love, duty, with the overlapping middle area left blank temporarily.

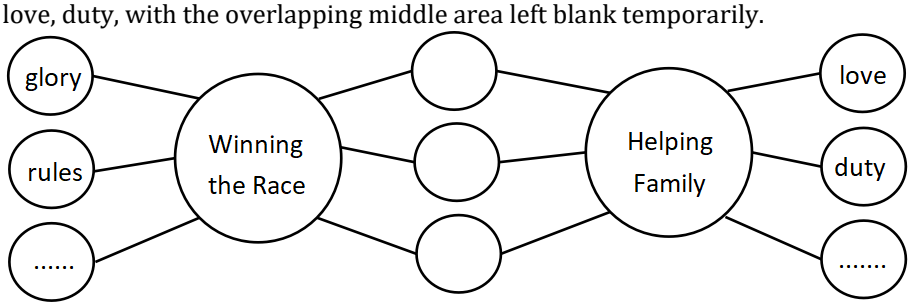


Figure 1. Illustration of a Double Bubble Map

By creating visualized cognitive conflict via the double bubble map, teachers activate students' prior schema of competitive sports and spark active reflection. Voting engages students emotionally, stimulating deeper interest and deliberation on the core dilemma presented in the text. The intentionally blank overlapping zone creates a cognitive gap that fuels curiosity and exploration, motivating students to seek answers throughout reading. For instance, analyzing Alistair's story enables students to discover that the phrase "no longer an athlete" does not mean athletic glory and family affection are mutually exclusive. This realization deepens their grasp of sportsmanship and cultivates critical thinking.

4.2. Pre-reading Prediction: Bubble Map

The teacher presents the text's illustration of the Brownlee brothers supporting each other mid-race and the article title, guiding students to predict the brothers' relationship based on visuals and headings. A bubble map template (Figure 2) is distributed for group brainstorming, where students fill peripheral bubbles to list potential descriptions of the sibling bond.

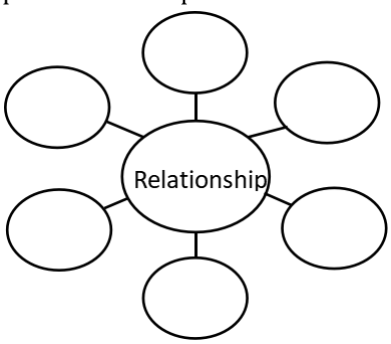


Figure 2. Illustration of a Bubble Map

The bubble map externalizes students' preliminary predictions and interpretations of the Brownlee brothers' relationship, stimulating imagination and prompting collaborative discussion to broaden mutual perspectives. This interactive learning model develops students' teamwork and communication skills.

4.3. While-reading Text Deconstruction

4.3.1. Brace Map

Students skim the full text and complete a brace map (Figure 3) to sort out the text framework and main idea of each paragraph: Hook (Opening Paragraph): The World Triathlon Series event was about to kick off on the track; Alistair made the choice to assist his brother; The origin of the Brownlee brothers' story. Meat (Body Paragraphs): Divided public opinions: prioritize victory or prioritize kinship. Tail (Concluding Paragraph): A simple closing.

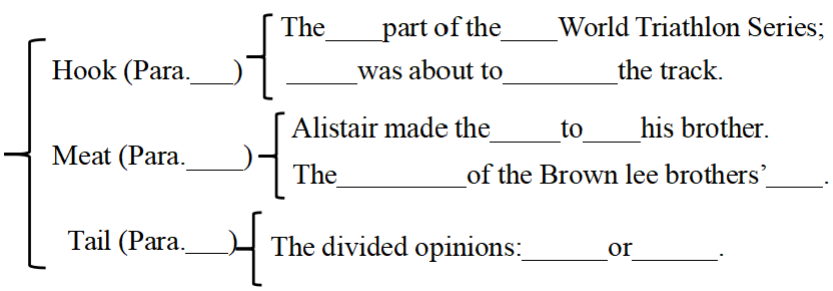


Figure 3. Illustration of a Brace Map

Featuring a clear hierarchical structure, the brace map equips students to identify the article's main storyline and distinguish primary from secondary information. Guided fill-in tasks lower task difficulty and boost student participation. This

teaching approach transforms students from passive recipients into active knowledge constructors. As they engage in analysis and exploration, they deepen comprehension of English reading texts while building confidence and interest in English learning.

4.3.2. Flow Map

Students read the first and second paragraphs closely and fill in five key action nodes on the flow map (Figure 4):

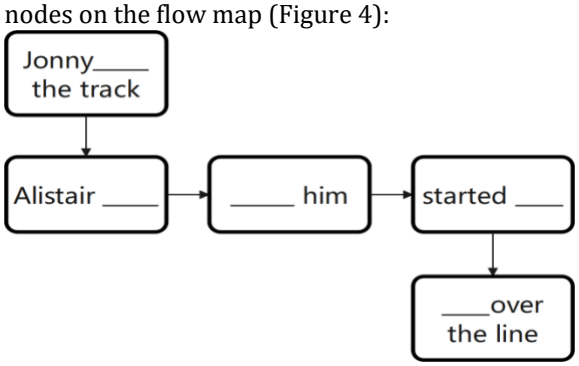


Figure 4. Illustration of a Flow Map

Completing the flow ma p enables students to intuitively trace the sequence of actions Alistair took after Jonny's fall. The chain of action verbs (ran towards him, caught him, started pulling) vividly conveys Alistair's urgency and care for his brother. This method clarifies the chronological development of events and helps students perceive the emotional bond between the two characters.

4.3.3. Tree Map

Students conduct close reading of Paragraph 3 and complete three core nodes on the tree map (Figure 5) outlining the evolution of the brothers' emotional bond under the central theme.

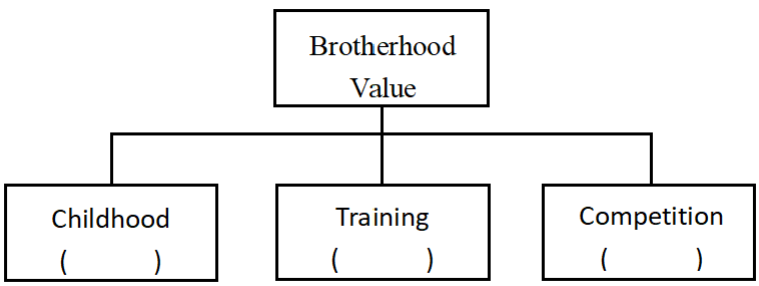


Figure 5. Illustration of a Tree Map

The tree map delineates the clear trajectory of the brothers' evolving bond, spanning imitation in childhood, mutual support during training, and reciprocal motivation in competitions. This framework clarifies the text's emotional thread, encourages reflection on interpersonal development, and strengthens students'

emotional cognition and reading comprehension skills.

4.3.4. Double Bubble Map

Students read Paragraph 4 thoroughly and revise the double bubble map introduced in the lead-in phase (Figure 6), filling the overlapping middle section with shared attributes of championship glory and family affection: emotion, spirit, value.

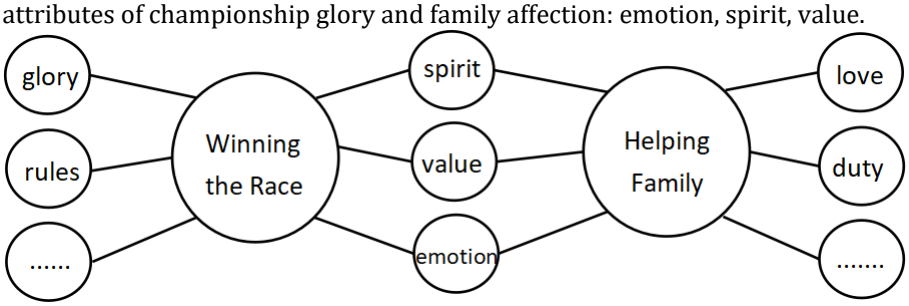


Figure 6. Illustration of a Double Bubble Map

By supplementing the overlapping zone of the double bubble map, students gain profound insight into the core value of both glory and kinship: they serve as spiritual anchors, reflections of personal values, and sources of emotional fulfillment. To complete the chart, students must extract key details from the text, refining their reading skills and encouraging exploration of the text's underlying connotations.

4.4. Post-reading Knowledge Transfer: Concept Map

The teacher organizes a debate centered on the topic: Should sports award humanity over rules? Students prepare arguments and rebuttals based on a concept map (Figure 7):

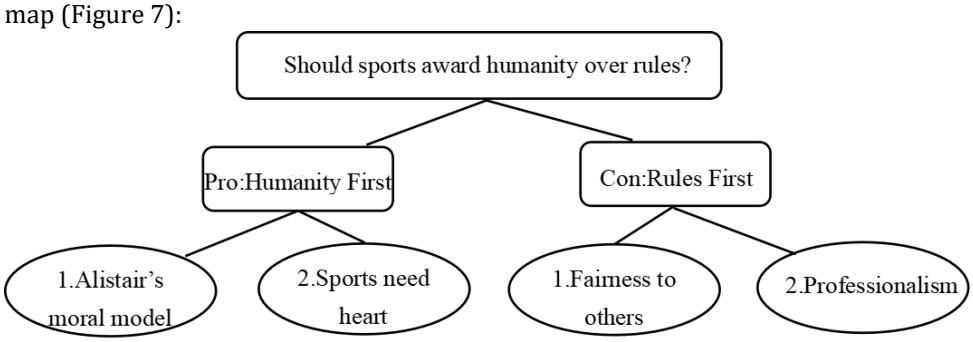


Figure 7. Illustration of a Concept Map

The concept map visualizes logical connections between arguments and evidence, enabling students to organize debate materials systematically and coherently. During preparation, the chart clarifies interrelated reasoning to enhance the fluency and persuasiveness of oral arguments. Beyond practicing oral expression and adaptability, the debate deepens students' reflection on the core of sportsmanship—balancing competitive rules and human compassion. The concept map acts as a "thinking navigator" for students, supporting multi-dimensional analysis of the debate topic to facilitate internalization and transfer of textual

knowledge.

5. Conclusion

Faced with the universal challenge that students' thinking processes remain invisible in senior high school English reading teaching, thinking visualization delivers an innovative solution through its unique graphical representation strengths. By converting abstract information processing, logical connections and structural analysis into intuitive visual graphics, it creates an observable pathway for intellectual development and drives a shift in English reading teaching from pure knowledge transmission to targeted higher-order thinking cultivation.

Teaching practice reveals the remarkable value of visualization tools across all reading stages:At pre-reading stage: Comparative graphics activate students' background knowledge, spark cognitive conflict and stimulate exploratory curiosity; At while-reading stage: Structural tools support systematic text parsing, tracking of event timelines and clarification of emotional logic, rendering previously invisible thinking paths transparent; At post-reading stage: Comprehensive graphics serve as a bridge for in-depth thematic reflection and critical analysis, enabling internalization and transfer of knowledge.

This approach resolves the longstanding difficulty that teachers cannot observe students' thought processes directly. Multi-modal visual representation reduces the cognitive load of complex discourse, integrates linguistic training with thinking development, and creates space for higher-order thinking activities including evaluation and innovation.

Looking ahead, continuous exploration is required in multiple areas: optimizing tool adaptation for different text genres and varying student cognitive levels; strengthening teachers' instructional design capacity for visualization pedagogy; and integrating digital technology's interactive functions to deepen thinking training outcomes. Only by refining practical pathways can educators build efficient English reading classes centered on thinking development and aligned with core competency goals, laying a solid foundation for students' lifelong learning and all-round development.

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