An Empirical Study on the Multidimensional Synergistic Effects of Follow-up Writing in Senior High School English under the Guidance of a Question Chain Approach

Wang Yutong

[**Abstract**] As a key assessment format for evaluating high school students' core competencies in English, continuation writing faces a significant pedagogical challenge: students often struggle to achieve deep alignment with the original text in both linguistic form and discourse logic. Drawing on the interactive synergy model and the question chain theory, this study aims to quantitatively evaluate the practical impact of a question chain instructional approach on enhancing collaborative effects in continuation writing. A quasi-experimental design was employed, with 93 first-year high school students from a school in Bengbu City, Anhui Province, serving as the sample. The experimental group underwent a three-phase teaching sequence incorporating introductory, diagnostic, exploratory, and summarizing question chains, while the control group followed conventional instruction. Empirical analysis was conducted across three dimensions—vocabulary, syntax, and discourse—using pre- and post-test essay corpora, questionnaires, and statistical tests. Data analysis revealed that the question chain significantly boosted the diversity of lexical coordination, with the experimental group exhibiting statistically significant differences ($p<0.05$) in the frequency of root-related and synonymic coordination compared to the control group. At the syntactic level, it effectively promoted creative reconfigurations of phrases and sentence structures, substantially reducing mechanical, complete coordination while increasing the degree of partial coordination ($p = 0.005$). At the discourse level, it markedly enhanced logical coherence and structural consistency, with the experimental group's overall discourse coordination score improving far more than that of the control group ($p = 0.002$). These findings confirm that a systematic question chain approach, by intensifying interaction and constructing an effective cognitive scaffold for reading and writing, represents a scientifically grounded pathway for enhancing collaborative effects in continuation writing.

[**Key words**] question chain; continuation writing; senior high school English; synergistic effect

[**About the author**] Wang Yutong (2005—), female, from Bengbu, Anhui, China, bachelor in foreign languages and literature from the School of Foreign Languages at Anqing Normal University. Research interests: foreign language pedagogy and applied linguistics.

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[**Website**] www.oacj.net

1 Introduction

With the in-depth implementation of the "English Curriculum Standards for Senior High Schools (2017 Edition)", the practical application of core competencies in English has become a central focus of curriculum reform. As a comprehensive task that deeply integrates reading comprehension with creative writing, continuation writing has attracted considerable attention from the academic community due to its effectiveness in assessing and enhancing students' overall language proficiency. Wang Chuming (2012) proposed the "leveling effect", which argues that the compulsory nature of "continuation" in continuation writing prompts learners to produce output based on their understanding of the original text, thereby raising their language proficiency toward the original...

The text aligns with this. However, frontline teaching practice reveals that students often encounter issues such as fragmented plot logic, inconsistent stylistic coherence, and a lack of cohesive devices in their continuation-

writing tasks. At its core, these problems reflect insufficient intensity in the reading-writing interaction and the failure to effectively activate synergistic effects.

In response to the aforementioned challenges, this study introduces the "question chain" as a pedagogical intervention variable. The question chain is not merely a collection of isolated questions; rather, it is a hierarchical cognitive scaffold constructed in accordance with principles of cognitive development, capable of making implicit collaborative processes explicit. Although existing research has examined the application of question chains in single skills such as reading or writing, empirical studies that situate them within the micro mechanisms of collaborative effects in continuation writing tasks—particularly those employing corpus-based data and multi-dimensional quantitative analyses—remain limited. This study aims to validate, through rigorous experimental design and data analysis, the specific collaborative effects of the question chain teaching approach at the lexical, syntactic, and discourse levels, with the goal of providing an evidence-based practical framework for high school English continuation writing instruction.

2 Theoretical framework

2.1 Question chain: from cognitive scaffold to interactive medium

The theory of the question chain emphasizes the systematic nature and logical interconnections of instructional questions. Pei Song (2011) defines it as a sequence of closely linked questions constructed by teachers based on instructional objectives and students' cognitive experiences. Wang Houxiong (2010) further elaborates its guiding and inquiry-oriented functions, arguing that the question chain can steer students' thinking from surface-level analysis toward deeper understanding. Within the theoretical framework developed in this study, the question chain is endowed with a dual function: first, as a cognitive scaffold during the reading phase, compelling students to attend to the text's linguistic forms and logical structure; second, as an interactive medium in the writing phase, where diagnostic and inquiry-based questions create a virtual "reader-author" dialogue, thereby providing the requisite level of interaction to foster synergistic effects.

2.2 Synergy: interaction alignment and structural activation

Alignment originates from the interactional alignment model proposed by Pickering and Garrod (2004), which posits that interlocutors automatically align their linguistic representations during interaction to reduce cognitive load and facilitate comprehension and output. Wang Chuming (2014) introduced this concept into foreign language teaching, arguing that the synergistic effect of writing after reading is the core mechanism underlying "learning through continuation", whereby the produced language aligns with the input language in terms of vocabulary, syntax, and discourse. Bock's (1986) structural priming theory offers a psychological explanation for syntactic synergy, suggesting that people tend to repeat syntactic structures they have recently encountered. However, Wang Chuming (2018) emphasizes that the strength of synergy depends on the depth of interaction; mere reading is passive, and only through external intervention to enhance interaction can synergy shift from "unconscious imitation" to "conscious learning".

2.3 Theoretical framework: Question Chain—Interactive Reinforcement—Multidimensional Coordination

Based on the aforementioned theory, this study constructs a "Question Chain—Interactive Reinforcement—Multidimensional Coordination" framework. This framework posits that, at the input level, the question chain enhances students' attention allocation to both the linguistic forms and the discourse logic of the source-text through diagnostic and exploratory functions; at the interaction level, the high-frequency, in-depth dialogue scenarios generated by the question chain satisfy the "reinforced alignment" condition outlined in the interactive alignment model; and at the output level, under the dual influence of structural activation and interactive reinforcement, students demonstrate higher level lexical reuse, syntactic restructuring, and discourse coherence in their continuation tasks.

3 Research methodology

3.1 Research subjects

This study employed convenience sampling, selecting a total of 93 first-year high school students from two parallel classes at a high school in Bengbu City, Anhui Province. To ensure homogeneity, both classes were taught by the same English teacher with five years of experience; there was no significant difference in their average entrance exam English scores ($p>0.05$), and none had previously received specialized training in post-reading writing. Following random assignment, Class 1-3 served as the experimental group ($n=48$), while Class 1-4 served as the control group ($n=45$). After excluding invalid responses during the experiment, the final effective sample comprised 46 students in the experimental group and 44 students in the control group.

3.2 Research variables and instruments

Independent variable: the teaching model for post-reading continuation writing. The experimental class employs a "three stage teaching method incorporating a question chain", while the control class uses a "conventional text reinforcement plus task description teaching method".

Dependent variable: the synergistic effect of post-reading writing, operationalized into three dimensions:

Lexical Coordination: original text vocabulary reuse rate, frequency of cognate word usage, and accuracy of synonym substitution.

Syntactic Coordination: Phrase - structure coordination (complete/incomplete), sentence - structure coordination (complete/incomplete).

Discourse Coordination: Scoring of Content Logical Coherence and Structural Echo Completeness.

Control Variables: instructional duration, instructor, textbook edition, test difficulty, homework load, and extracurricular tutoring.

Research Instrument: a continuation-writing test. Both the pre-test and post-test items were drawn from actual college entrance examination questions or high-quality mock tests, with difficulty coefficients maintained between 0.55 and 0.60. Scoring employed a two-dimensional rubric assessing both "content" and "language", with a total possible score of 25 points; inter-rater reliability, as measured by Kappa, was 0.82.

Questionnaire: "Questionnaire on Learning Experience and Collaborative Perception in Continuation Writing", which employs a five-point Likert scale to assess the degree of perceived relevance and collaborative perception.

Analytical Software: AntConc 3.5.8 was used for corpus-based text analysis, and SPSS 26.0 was used for statistical data analysis.

3.3 Experimental design

The study employed a quasi-experimental design, with an experimental period of four months (March to June 2026), divided into 12 weeks. Weeks 1-2 constituted the pre-experimental phase, during which pretests and baseline surveys were conducted; Weeks 3 - 10 formed the experimental phase, involving an eight - week instructional intervention in which participants completed one post-reading writing task every two weeks; Weeks 11-12 comprised the post-experimental phase, characterized by posttests, questionnaire collection, and follow-up interviews.

4 Research process

4.1 Implementation of the experimental intervention

The experimental class strictly adheres to the "three - stage teaching method", integrating four types of question chains throughout the entire reading and writing process. Taking the Week 4 materials from the experiment, "Underdog Triumphs in Writing Contest", as an example:

Pre-reading stage (introductory question chain): Focuses on motivating students to consider "what to write". The teacher guides students to examine the title and illustrations, predict the protagonist's personality and

challenges, connect with their own life experiences to explore the key elements of an underdog's comeback, and anticipate the descriptive techniques the text might employ. This stage aims to activate prior schemata, establish emotional connections, and lay the psychological groundwork for subsequent collaborative work.

Reading stage (diagnostic and inquiry-based question chain): Focuses on in-depth processing of "how to read" and "how to continue".

Diagnostic: Students are asked to identify three verbs/phrases that depict the protagonist's "nervousness" and analyze their rhetorical effect; they must also examine the function of the underlined sentence, "His heart pounded like a drum", and consider possible sentence structures that could serve as continuations. This stage compels students to focus on linguistic form and pinpoint points of convergence. Inquiry-based: Examine the internal conflict that leads the protagonist to consider giving up, and explore how the original text's foreshadowing supports the "honorable defeat" ending. This stage encourages students to engage in a dialogue with the author on both logical and textual levels.

Post-reading stage (summary-based question chain): Focuses on self-monitoring and self-assessment of "how well the writing is done". Before putting pen to paper, students must answer: Which two keywords from the original text must be included in the first paragraph of their continuation? What sentence structure do they plan to emulate when describing the climax? Does the ending respond to their pre-reading predictions? By completing a "collaborative self-assessment checklist", students transform collaborative awareness into concrete writing plans.

The control class followed the standard procedure: after reading, the teacher explained new vocabulary and analyzed the main ideas, assigned a continuation task, and focused solely on handwriting and grammar, without employing systematic question chains or collaborative self-checking.

4.2 Data collection and processing

After the experiment concluded, 90 valid post-test essays were collected, scanned and converted into text format, and then analyzed using AntConc to extract lexical and syntactic features. Meanwhile, questionnaires were retrieved, and three students from each of the high-, medium-, and low-scoring groups were selected for semi-structured interviews, thereby triangulating the data to verify the reliability of the quantitative findings.

5 Research and analysis

This section, drawing on corpus analysis results from AntConc and SPSS statistical test data, conducts an in-depth empirical examination of the impact of question chains on collaborative effects across three dimensions: vocabulary, syntax, and discourse.

5.1 Lexical coordination: from mechanical reuse to the diversified expansion of meaning construction

Lexical coordination constitutes the foundational level of post-reading writing. Pretest data revealed that the proportion of source-text words in the experimental and control classes was 0.689 and 0.761, respectively; an independent samples t test indicated no significant difference ($p > 0.05$), suggesting that the two groups began with comparable levels of lexical coordination. Post-test results, however, exposed a significant group level disparity: the experimental class's proportion of source-text words decreased to 0.626, whereas the control class remained at 0.662. More crucially, the capacity to generate lexical variants emerged: in the experimental class, the number of coordinated occurrences of root-related words rose from 217 before the intervention to 265, while coordinated uses of synonyms surged from 90 to 156, totaling 421 instances—accounting for 48.5% of all keyword occurrences. By contrast, in the control class, coordinated root-related word usage declined from 196 to 153, with synonymic coordination remaining steady at 90, yielding a combined total of only 27.3%. Statistical analyses further confirmed that, following the intervention, both classes exhibited significant differences in root-related word coordination ($t=2.34$, $p<0.05$) and synonymic coordination ($t=3.12$, $p<0.05$). These findings suggest that diagnostic questions embedded within the question chain—such as "Analyze the rhetorical effect of the verb"—

effectively activated students' deep semantic understanding of the source-text, enabling them, during the writing task, to move beyond mechanical reproduction of source-text vocabulary. Instead, they were able to engage in root-related morphological variation or synonymic substitution based on contextual cues, thereby achieving a diversified expansion of lexical coordination grounded in meaning construction.

5.2 Syntactic coordination: a transition from formal imitation to creative reconstruction

Syntactic coordination reflects the extent to which students have internalized the linguistic structure of the source-text. Post-test data reveal a starkly contrasting distribution between "complete coordination" and "incomplete coordination". The experimental class scored significantly lower than the control class on both complete phrase coordination ($M=2.250$) and complete sentence coordination ($M=1.75$), with respective means of $M=5.933$ and $M=3.111$; these group differences were highly significant ($p=0.005$). Conversely, the experimental class exhibited significantly higher scores than the control class on incomplete phrase coordination ($M=6.438$) and incomplete sentence coordination ($M=3.833$) ($p<0.05$). These findings carry important pedagogical implications: students in the control class tend to "copy" the original sentence structures verbatim, resulting in a high proportion of complete coordination, which often leads to continuations that are disconnected from the original context—a phenomenon of mechanical, literal reproduction.

In contrast, guided by a sequence of questions—particularly inquiry-based ones—the experimental class came to grasp the logical functions of the source sentence patterns and, in their continuations, adapted these patterns through lexical substitution, syntactic expansion, or reordering to suit the demands of the new narrative, thereby demonstrating a high rate of "incomplete coordination". Statistically significant differences confirm that the question-based instructional approach facilitates a shift in syntactic coordination—from low-level formal imitation to higher-order creative reconstruction—thus achieving genuine internalization of syntactic structure.

5.3 Discourse coordination: enhanced holistic advancement and structural resonance

Discourse coherence represents the highest level of post-reading writing, encompassing both content logic and macrostructure. Post-test discourse coherence scores reveal that the experimental class achieved an overall score of 70.333, an improvement of 7.791 points compared to the pre-test; by contrast, the control class showed only a marginal increase of 0.178 points (to 62.178), with a highly significant difference between the two groups ($p=0.002$). When examined across sub-dimensions:

Content Coordination: In the experimental class, the score increased from 31.979 to 34.833 ($p=0.007$), indicating that the inquiry-based questions in the question chain effectively strengthened the logical coherence of plot development and reduced instances of "sudden plot shifts" or "logical discontinuities".

Structural Coordination: The experimental class showed the largest improvement, with a gain of 4.937 points (from 30.563 to 35.500, $p=0.001$). This was attributable to the monitoring function of summative question chains—such as "Does the ending respond to the pre-reading prediction?"—which prompted students to consciously incorporate foreshadowing and echo earlier text in their continuations, thereby constructing a coherent narrative closure.

The data fully demonstrate that the question chain not only enhances local linguistic coordination but also achieves a comprehensive leap at the macro discourse level, effectively addressing the persistent issue of students being able to write but lacking coherent structure.

6 Research conclusions

Based on the aforementioned empirical analysis, we arrive at the following three core conclusions:

Question chain instruction effectively fosters meaning-based vocabulary coordination. Data confirm that the question chain significantly increases the frequency of coordinated use of cognates and synonyms, indicating that students have shifted from rote reproduction to context driven production of lexical diversity, thereby achieving deep-level vocabulary coordination.

Question chain instruction has facilitated the shift of syntactic coordination from formal imitation to creative reconstruction. The marked increase in "incomplete coordination" and the corresponding decrease in "complete coordination" in the experimental class demonstrate that the question chain helps students internalize syntactic logic, enabling them to flexibly restructure the original sentence patterns in response to continuation writing tasks, rather than resorting to rigid, literal copying.

Question chain instruction serves as a crucial scaffold for achieving deep-level discourse coordination. The significant improvements observed across the dimensions of overall coherence and structural alignment indicate that the question chain, by strengthening logical reasoning and structural monitoring, effectively enhances the correspondence between the continuation and the original text in terms of plot logic and macrostructure, thereby realizing an overall optimization of reading-writing interaction.

Based on the research findings, we propose the following pedagogical implications:

Design a hierarchical, interconnected sequence of questions to guide in-depth textual analysis. Teachers should move away from fragmented questioning and, following the "introduction-diagnosis-exploration-summary" framework, craft a coherent chain of questions that compel students to attend to both linguistic forms and logical structures during reading, thereby providing high-quality input for collaborative learning.

Strengthen training in logical thinking and discourse structure, and construct narrative frameworks. In both inquiry-based and summarization-oriented questions, emphasis should be placed on guiding students to trace plot development and identify structural correspondences, helping them cultivate an awareness of the "foreshadowing-response" pattern in discourse and enhancing their ability to coordinate textual structure.

Deepen the synergy between style and emotion, fostering an in-depth dialogue with the author. The design of the question sequence should integrate both emotional engagement and stylistic appreciation, guiding students in their continuations to not only emulate the "form" but also convey the "spirit", thereby achieving a dual alignment of linguistic form and emotional tone.

7 Final remarks

Although this study has confirmed the positive synergistic effects of question chains on post-reading writing, several limitations remain. First, the sample is drawn from a single school, limiting its representativeness; thus, caution is warranted when generalizing the findings. Second, the 12-week experimental period is relatively short, leaving the long-term durability of the question chain effect unverified. Finally, the collaborative measures rely primarily on corpus frequency analysis and human scoring; future research could incorporate cognitive neuroscience methods such as eye tracking and electroencephalography to further elucidate the underlying mechanisms of collaboration at the level of cognitive processing.

Future studies might explore the following avenues: first, adopt multi-center stratified sampling to enhance the ecological validity of the research; second, extend the observation period and conduct longitudinal follow-up studies to examine the maintenance and transferability of the synergistic effects; and third, develop a multidimensional collaborative assessment framework that integrates cognitive, affective, and behavioral dimensions, thereby deepening the theoretical understanding of the "question chain—collaboration" mechanism.

References:

[1] Atkinson D., Nishino T., Churchill E., et al. Alignment and Interaction in a Socio-cognitive Approach to Second Language Acquisition[J]. *The Modern Language Journal*, 2007, 91(2): 169-188.

[2] Bock J. K. Syntactic Persistence in Language Production[J]. *Cognitive Psychology*, 1986, 18(3): 355-387.

[3] Pickering M. J., Garrod S. Toward a Mechanistic Psychology of Dialogue[J]. *Behavioral and Brain Sciences*, 2004, 27(2): 169-226.

[4] Hua Wei. A Study of Synergetics in Foreign Language Teaching[J]. *Journal of Qiqihar University*

(*Philosophy and Social Sciences Edition*), 2001(4): 88-90.

[5] Lian Caizhen. An Exploration of Teaching Strategies for Post-reading Continuation Writing in Senior High School English from a Collaborative Perspective[J]. *English Teacher*, 2024, 24(17): 117-122.

[6] Lyu Runwen. On the Synergistic Effects of the Teaching Process[J]. *Journal of Qiqihar Normal University* (*Philosophy and Social Sciences Edition*), 1991(3): 85-86.

[7] Pei Song. The Application of Question Chains in Senior High School English Reading Instruction[J]. *Journal of the School of Foreign Languages, Shandong Normal University* (*Basic English Education*), 2011, 13(6): 75-79.

[8] Qian Hongyan. An Exploration of the Application of Question Chains in Senior High School English Writing Instruction[J]. *English Teacher*, 2016, 39(10):56-58.

[9] Wang Chuming. Interaction and Collaboration in Foreign Language Teaching[J]. *Foreign Language Teaching and Research*, 2010, 42(4): 297-299.

[10] Wang Chuming. Post-reading Continuation Writing: An Effective Approach to Enhancing Foreign Language Learning Efficiency[J]. *Foreign Languages*, 2012(5): 2-7.

[11] Wang Min, Wang Chuming. The Synergistic Effect of Continuing Writing after Reading[J]. *Modern Foreign Languages*, 2014(4): 501-512, 584.

[12] Wang Chuming. How Does Continuation Writing Effectively Promote Learning? [J]. *Foreign Language Teaching and Research*, 2015, 47(5): 753-762, 801.

[13] Wang Chuming. From "Writing to Promote Learning" to "Continuation to Promote Learning"[J]. *Foreign Language Teaching and Research*, 2017, 49(4): 547-556, 639-640.

[14] Wang Chuming. How to Enhance Interaction in Post-reading Writing[J]. *Foreign Languages*, 2018(5): 40-45.

[15] Wang Duqin. *Theory of English Teaching Strategies*[M]. Beijing: Foreign Language Teaching and Research Press, 2015.

[16] Wang Houxiong. Types and Pedagogical Functions of "Question Chains"—A Case Study in Chemistry Instruction[J]. *Educational Science Research*, 2010(5): 50-54.

[17] Ye Ruhua. A Study on the Impact of Interactive Reinforcement Strategies on Synergistic Effects in High School Students' English Post-reading Writing[D]. Nanjing: Nanjing Normal University, 2021.

[18] Ministry of Education of the People's Republic of China. *English Curriculum Standards for Senior High Schools* (2017 *Edition*)[M]. Beijing: People's Education Press, 2018.