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Integrating Cognitive Dissonance Theory into the "Teacher-Student-AI" Triadic Cognitive Interaction Model-Based on College English Reading and Writing Courses

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Abstract

Against digital transformation in higher education, the traditional teacher-student binary mode fails to meet personalized college English reading and writing needs. The "Teacher-Student-AI" Triadic Cognitive Interaction Model integrates generative artificial intelligence tools into daily classroom instruction, balances standardized group teaching and individual guidance, emerging as mainstream intelligent foreign language teaching direction. Nevertheless, the current triadic interaction frameworks only optimize external teaching procedures but ignore learners' internal cognition, resulting in superficial class communication and students' long-term over-reliance on instant feedback generated by AI platforms. Few scholars take Festinger's Cognitive Dissonance Theory as the core analytical tool to build targeted triadic frameworks for EFL reading and writing. This paper systematically sorts out and evaluates domestic and international literature reviews relevant domestic and foreign literature, analyzes shallow interaction's psychological roots via Cognitive Dissonance Theory, and constructs an optimized interdisciplinary triadic model with practical teaching strategies. Its research enriches intelligent foreign language education theories and provides systematic references for college English curriculum design and reform.

Subject Areas

Reform of College English Teaching, Educational Psychology, Artificial Intelligence in Foreign Language Education

Keywords

Triadic Cognitive Interaction, Teacher-Student-AI Model, EFL Reading and Writing, Cognitive Dissonance Theory, Student Cognitive Development

1. Introduction

In the digital and intelligent era, information technology has been deeply integrated into all links of college foreign language education, which puts forward higher comprehensive requirements for traditional teacher-student dual interactive teaching modes. The simple two-party interaction between teachers and students is difficult to fully satisfy the multi-dimensional learning needs of modern college English reading and writing courses, including personalized error correction, autonomous inquiry and critical thinking training. The Teacher-Student-AI Triadic Cognitive Interaction Model embeds intelligent AI auxiliary tools into all stages of reading and writing teaching, realizing the organic balance between large-class unified teaching and individualized learning support, and has become a widely recognized mainstream path for the reform of intelligent college English teaching.

Nevertheless, when reviewing the existing domestic and foreign research results surrounding this triadic model, we can find a prominent research bias. Most scholars' research priorities fall on the optimization of external teaching links, curriculum process design and the functional testing of AI tools, while few studies pay sustained attention to learners' internal psychological changes and cognitive operation states during the three-party interaction. This insufficient research perspective leads to many prominent unsolved practical obstacles in the actual intelligent English classroom, forming an obvious research blank area that needs to be supplemented and enriched by subsequent interdisciplinary research. At present, relevant research rarely introduces mature classic social psychological theories to systematically analyze the above-mentioned classroom predicaments, and there is a lack of improved triadic interaction frameworks customized for the characteristics of college English reading and writing teaching.

Taking college English reading and writing courses as the specific research carrier, this theoretical review systematically sorts out and summarizes the relevant domestic and foreign research literature published in recent years. It adopts a classic social psychological theoretical perspective as the core analytical tool to explore the deep-seated restrictive factors that hinder the expected teaching effects of the triadic interaction model, and further constructs an improved triadic cognitive interaction model that fits the actual teaching context of EFL reading and writing. The research results of this paper can enrich the theoretical construction dimension of intelligent foreign language education, and provide systematic theoretical references for colleges to carry out English curriculum planning and daily classroom instructional design.

2. Literature Review

2.1. Research on Teacher-Student-AI Triadic Cognitive Interaction between Home and Abroad

With intelligent education reform advancing, traditional dual teacher-student interaction cannot meet the personalized demands of modern college English teaching [1] [2]. Domestic scholars have constructed Teacher-Student-AI triadic collaborative frameworks to balance large-class teaching and individualized learning.

Zhang and Ouyang built a symmetrical reciprocal symbiosis triadic model based on symbiosis theory, clarifying differentiated roles of teachers, students and AI agents in English courses [1]. Men designed pre-class, in-class and after-class interactive procedures for triadic classrooms, proving that AI can serve as a data bridge to optimize teaching feedback [2].

The Teacher-Student-AI triadic cognitive interaction model in the present study draws theoretical inspiration from Bandura's triadic reciprocal determinism [3] and existing domestic research on human-AI collaborative language teaching [4]. This framework depicts the dynamic cognitive exchanges among teachers, students and AI tools within EFL, reading-writing classrooms, in which teachers dominate instructional arrangement and classroom decision-making, students act as core subjects of knowledge construction, and AI tools function as technical auxiliary support providing feedback and prompting without teaching decision-making power. Teaching outcomes are produced through continuous reciprocal coordination of the three participants.

It is worth clarifying that Bandura's original triadic reciprocal determinism describes mutual interactions among personal factors, behaviour and environment rather than teacher-student-agent classroom subjects [3]. This study inherits its core idea of triadic reciprocal interaction yet re-configures its constituent elements to fit AI-empowered college English reading-writing contexts, which represents an adaptive theoretical transformation instead of a direct application of the original framework.

International researchers have also devoted sustained attention to multi-agent interactive modes in language teaching. A range of overseas studies have designed intelligent classroom interaction workflows to improve teaching efficiency [5]. However, consistent with domestic research priorities, most overseas investigations focus on adjusting technical functions and teaching procedures, while paying limited attention to learners' inner cognitive changes during human-machine collaboration. In general, triadic-related research at home and abroad tends to focus on external teaching design rather than learners' subjective psychological experience.

Nevertheless, current domestic triadic studies mainly discuss external teaching processes and technical effects, ignoring learners' internal cognitive changes during human-machine interaction [6]. Few papers explore the psychological roots of superficial classroom interaction.

2.2. Research on AI-Assisted College English Reading and Writing

Generative AI has been widely applied to college English reading and writing courses in China in recent years [7]. Systematic reviews of CNKI literature show that AI tools can automatically correct grammar errors, provide instant writing feedback and reduce teachers' repetitive correction work [8].

However, most domestic studies only verify the positive functions of AI writing tools, while neglecting students' learning inertia and over-reliance on machine output [9]. The negative cognitive conflicts caused by long-term AI-assisted learning have not been thoroughly analyzed in existing CNKI papers.

Such learning challenges are not limited to Chinese EFL classrooms. Empirical research conducted in European higher-education contexts reveals that university students exhibit ambivalent stances toward generative-AI writing support [10]. Although students acknowledge that independent thinking is essential for language improvement, they tend to rely on convenient AI-generated feedback to reduce learning pressure, which creates persistent inner psychological tension during reading-writing tasks [11].

2.3. Research on the Cognitive Dissonance Theory in Foreign Language Field

Cognitive Dissonance Theory proposed by Festinger explains psychological discomfort caused by contradictory individual cognition [12]. Domestic scholars mainly apply this theory to analyze middle school students' English learning motivation and anxiety [13].

Overseas psychological research has continuously expanded the application scope of Cognitive Dissonance Theory. Han and Zhang reviewed decades-related studies and confirmed that this theory is highly suitable for analyzing learners' psychological pressure in technology-enhanced classrooms [14]. Even so, foreign language education researchers still rarely adopt this theory to interpret practical dilemmas in AI-assisted EFL reading-writing classrooms.

Recent overseas research confirms that when using GenAI for English writing, Chinese college students produce obvious cognitive dissonance: they intend to think independently but rely on AI to reduce cognitive burden. Although existing research has conducted various discussions around the application of GenAI in college English reading and writing classrooms, the aspect of Cognitive Dissonance Theory is a bit weak.

As a core theoretical foundation of the present research, Cognitive Dissonance Theory assumes that individuals will generate inner psychological tension when two conflicting cognitions co-occur. People tend to adjust their beliefs or behaviors actively to relieve such uncomfortable feelings and restore cognitive consistency.

When applied to triadic EFL classroom contexts, cognitive dissonance should be attributed to individual teachers or students instead of originating from AI. Conflicting feedback provided by AI tools may clash with learners' pre-existing

knowledge and original learning perceptions and act as an external trigger or situational moderator to evoke such inner psychological contradictions within human agents. Persistent cognitive conflicts within individuals can lower students' learning engagement and further bring about formalized and superficial classroom communication. This psychological perspective provides a unique analytical lens for interpreting inefficient intelligent teaching, and lays a solid theoretical basis for the following discussion on triadic classroom interaction.

2.4. Research Review

Existing domestic and foreign research yielded abundant achievements in triadic teaching design and AI-assisted English reading and writing instruction. There are three obvious research gaps as followed.

From a global research perspective, the above-mentioned limitations are shared by both domestic and international studies. Foreign scholars have noted learners' ambivalent psychological experiences alongside excessive AI dependence, but they seldom interpret these phenomena from the perspective of cognitive psychology [5] [10]. Few researchers at home and abroad attempt to put forward targeted classroom adjustment suggestions based on Cognitive Dissonance Theory.

First, triadic interaction researches overly emphasize external teaching design and ignore learners' internal cognitive mechanisms. Second, AI-assisted English teaching papers lack systematic psychological analysis of students' over-reliance on AI tools. Third, few domestic studies adopt Cognitive Dissonance Theory to interpret practical dilemmas in intelligent English classrooms.

Based on the above research gaps, this study analyses students' cognitive dissonance within triadic classrooms and puts forward corresponding optimization recommendations for college English reading and writing courses. It is expected to provide ideas for improving foreign language learning efficiency and promoting curriculum reform.

3. Discussion

3.1. Neglect of Internal Cognitive Mechanisms in Existing Triadic Teaching Research

It should be noted that superficial interaction and learners' long-term over-reliance on AI within triadic teaching contexts represent theoretical propositions advanced in this study. Obermüller et al. have documented surface-level learning behaviours and reduced cognitive engagement in human-AI collaborative settings [5], while Klitgård captures learners' inner psychological conflicts behind such human-machine learning scenarios [10]. Given that the teacher-student-AI triadic system retains the core human-AI interaction component, the present study reasons that these undesirable patterns may also manifest within the triadic teaching context, and this reasoning forms the foundation of the above propositions. These propositions, however, lack full support from comprehensive empirical evidence.

Domestic research on teacher-student-AI triadic interaction generally focuses on optimizing classroom procedures and AI functional effects, while ignoring learners' internal cognitive shifts during interaction [6]. Most reform schemes only adjust external teaching links and lack discussion on learners' psychological experience.

This limitation also exists in overseas studies. Obermüller *et al.* stated that most international AI collaborative learning research centers on classroom process design, rarely involving learners' inner psychological experience in human-machine interaction [5]. Klitgård further points out that existing research often overlooks learners' subjective psychological conflicts in AI-supported academic writing, without connecting these individual mental tensions to holistic teaching-learning systems, consistent with domestic research deficiencies [10]. Han and Zhang also pointed out educational technology research will face obvious bottlenecks if learners' cognitive balance is ignored [14].

Improvement of EFL reading and writing ability relies on learners' internal knowledge assimilation, and standardized unified teaching cannot meet personalized learning demands [15]. This explains why many triadic classroom activity designs fail to achieve ideal effects. Different from prior literature focusing only on external teaching optimization, this paper takes internal cognitive state as the core analysis perspective to fill the research gap.

3.2. Root Causes of Cognitive Dissonance in Triadic Classrooms from Three-Dimensional Perspectives

Based on Cognitive Dissonance Theory, the ubiquitous superficial interaction and learning inertia in current college English reading and writing triadic classrooms stem from cognitive conflicts among teachers, students, and AI subjects, and its underlying psychological causes can be analyzed from these three dimensions.

From the teachers' perspective, educators hold contradictory perceptions regarding intelligent teaching. On one hand, they recognize that AI tools can proofread spelling errors, compile reading data and streamline other repetitive work [8], so they actively adopt the triadic interaction model to boost teaching efficiency. On the other hand, constrained by conventional teaching experience, most instructors still prioritize knowledge transmission and task assignment as core teaching objectives. They fail to attach importance to students' internal cognitive changes and adjust personalized teaching strategies in response to learners' psychological shifts [16]. The tension between advocating intelligent, individualized instruction and adhering to traditional standardized teaching logic rigidifies triadic teaching design, making it ineffective in resolving students' learning psychological obstacles.

From the student perspective, dual cognitive conflicts emerge throughout their learning process. As confirmed by the empirical research of [9], college students have formed clear autonomous learning awareness in EFL reading and writing training, regarding independent critical thinking and repeated practice as the core

pathway to improving linguistic competence. Nevertheless, burdened by limited class hours and heavy academic workloads, students tend to rely heavily on instant AI feedback to reduce their cognitive load. The contradiction between their belief that self-directed learning fosters language proficiency and their actual behavior of over-reliance on AI tools generates pervasive cognitive dissonance among students. This eventually induces academic inertia; prolonged superficial learning further discourages learners from engaging in in-depth thinking, forming a vicious cycle.

From the AI dimension, the design logic of mainstream intelligent tools fails to align with the cognitive development rules of EFL learners. Such tools prioritize accuracy and standardization of knowledge feedback, and only provide uniform, formulaic suggestions for reading comprehension and writing revision [7]. However, college English reading and writing teaching emphasizes critical thinking, personalized expression and contextual understanding, which require diversified and open cognitive guidance [17]. Consequently, the mismatch between standardized mechanical outputs generated by AI and students' individualized cognitive development demands further exacerbates the superficialization of classroom triadic interaction.

3.3. Research Innovation and Optimization Strategies Based on Comparative Analysis of Previous Studies

By sorting domestic and foreign literature, this paper summarizes three common research deficiencies and puts forward targeted teaching optimization suggestions, with dual theoretical and practical innovations.

First, most existing studies on the triadic cognitive interaction model merely focus on the external optimization of teaching procedures and rarely explore learners' internal psychological conditions [6]. Second, current research concerning AI-assisted college English reading and writing instruction mostly emphasizes the practical value of technological application, while lacking in-depth analysis of learners' adverse psychological issues [9]. Third, few studies on the integration of AI and foreign language teaching adopt social psychological theories to interpret practical dilemmas in classroom settings [18].

Accordingly, this study puts forward three targeted optimization strategies for the triadic cognitive interaction model. First, establish a teaching design system oriented to cognitive dissonance management. Teaching activities should center on utilizing and transforming cognitive dissonance, and reading and writing tasks that moderately trigger cognitive conflicts should be designed. In college English writing tasks, teachers avoid giving direct corrections on students' early drafts to create such cognitive conflicts. Second, build a teacher-led human-AI collaborative mechanism for cognitive development. Teachers intervene at key stages, specifically after students receive the first round of AI feedback before they start draft revision. With teacher guidance, students use AI prompts that ask for logical analysis rather than ready-made revised sentences. Students then complete short reflection tasks to compare their own ideas with AI feedback and explain which sug-

gestions they will take or discard, facilitating their shift from over-reliance on technology to intelligent symbiosis through human-machine collaboration. Third, upgrade the cognitive guidance functions of AI tools. On the basis of delivering standardized feedback, AI platforms should add thought-provoking questions and critical thinking prompts that induce cognitive dissonance, encouraging students to evaluate AI feedback and make their own revision decisions. In this way, students can deepen their learning through the cycle of cognitive dissonance and active inquiry.

The potential working mechanism of AI feedback-induced cognitive dissonance functions through a complete progressive cognitive pathway within individual learners. In teacher-student-computer interactive English reading and writing tasks, learners establish initial cognitive judgments based on their existing language reserves and task understanding. Divergent evaluative information from systematic AI feedback creates deviation between learners' self-perception and objective task performance, and such information inconsistency disrupts learners' stable cognitive state. The broken cognitive balance further generates inner psychological discomfort and learning tension during task engagement. Individual learners produce spontaneous cognitive and behavioral adjustments to relieve internal psychological conflicts. These adjustments include the re-examination of reading reasoning logic, the modification of problematic writing expressions, and the optimization of personal learning strategies. The series of positive cognitive and behavioral changes correct learners' language cognition deviations, compensate for insufficient language knowledge, and improve learners' task completion quality. The overall learning performance of English reading and writing therefore achieves effective improvement. This systematic cognitive progression resonates with the psychological-behavior coupling mechanism under cognitive dissonance in human-AI collaborative learning research [14].

3.4. Theoretical Rationality of the Optimized Triadic Interaction Framework

Theoretically, Cognitive Dissonance Theory has long been adopted in educational psychology research. Existing literature has verified that regulating learners' cognitive imbalance helps stimulate deep learning outcomes and learning motivation [13] [19]. By adopting Cognitive Dissonance Theory to interpret the core dilemmas in AI-enabled classrooms, this study complies with the fundamental laws of cognitive learning in college English reading and writing courses, laying a solid psychological theoretical foundation for the optimized framework.

Academically, this research realizes interdisciplinary integration of foreign language teaching and social psychology. It adds a psychological analysis dimension to triadic interaction research, breaking the technology-oriented tendency that overlooks learners' internal mental states in prior human-AI learning studies [11] [14].

In terms of technical conditions, with the continuous upgrading of generative AI education technology, intelligent teaching platforms have realized personal-

ized data statistics and differentiated push functions [8]. It is technically feasible to optimize AI tool modules to increase critical thinking guidance and personalized feedback. At the same time, domestic colleges and universities have basically completed the construction of intelligent teaching environments, providing complete hardware and technical support for the implementation of the optimized triadic interaction model.

To sum up, the teaching adjustment suggestions proposed in this paper can provide valuable theoretical references for subsequent empirical research and the daily reform practice of college English reading and writing courses.

4. Conclusions

This study explores the typical practical dilemmas of teacher-student-AI triadic interaction in college English reading and writing courses. It adopts Cognitive Dissonance Theory as a psychological analysis tool to unpack the psychological logic behind superficial classroom interaction and shallow learning, and delivers targeted operable teaching suggestions suitable for real classroom practice.

The core finding of this paper is that the unsatisfactory teaching performance of mainstream triadic interactive modes is not caused by defective teaching processes or technical flaws alone. Its root lies in multi-dimensional cognitive dissonance existing among teachers, students and AI tools. Distinct from previous research that merely optimizes external teaching procedures and technical functions, this study introduces a psychological research perspective, links external interactive behaviors with learners' internal cognitive conditions, and forms a complete set of targeted teaching adjustment ideas covering teachers' teaching cognition, students' learning behaviors and AI feedback modes.

The psychological analysis logic used in this research has good interdisciplinary compatibility and logical rationality, which can offer clear theoretical references for follow-up studies on intelligent foreign language teaching.

In the context of deep integration of artificial intelligence and higher foreign language education, applying social psychological theories to intelligent classroom research is an essential supplement to teaching reform research and an important path to implement student-centered education. It is hoped that this research can inspire subsequent scholars to shift research emphasis from simple technical iteration to learners' internal cognitive development. In this way, the auxiliary value of AI can be balanced with the cultivation of students' independent critical thinking, so as to promote the high-quality development of college English reading and writing education in the intelligent age.

This study acknowledges that cognitive dissonance represents only one interpretive perspective for explaining students' learning behaviours within triadic classrooms. Other relevant factors, such as cognitive load, self-regulated learning abilities, learner agency and academic integrity risks, also exert influences on students' AI-assisted learning. Since this paper adopts a theoretical-analysis approach, these variables have not received full discussion in the present work and

require further empirical exploration in future studies.

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Conflicts of Interest

The authors declare no conflicts of interest.

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