

An Analysis of the Mechanism by Which Human-Machine Trust Influences AI-Assisted English Deep Learning

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Abstract: With the rapid advancement of artificial intelligence technology, AI applications in education have become increasingly widespread, and AI-assisted English learning has emerged as a prevalent instructional approach. In this context, human-computer trust—a critical factor influencing learning outcomes—has gained heightened significance. This study aims to thoroughly examine the mechanisms by which human-computer trust affects deep learning in AI-assisted English instruction. Through questionnaire surveys, data on learners' trust levels toward AI and their English learning progress were collected, complemented by interviews to gain insights into learners' experiences and perceptions. The research identifies specific mechanisms through which human-computer trust impacts learning motivation, strategy adoption, and learning outcomes. Based on these findings, the study proposes strategies to enhance human-computer trust—including optimizing AI technology, refining instructional design, and guiding learners—to provide theoretical foundations and practical recommendations for improving the effectiveness of AI-assisted deep learning in English education.

Keywords: Human-Machine Trust; AI Assistance; English Deep Learning; Influence Mechanism

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1. Introduction

1.1 Research Background

With the rapid advancement of artificial intelligence technology, its applications in education have become increasingly widespread, infusing new vitality into traditional teaching models. Particularly in language learning, AI-assisted English instruction has emerged as a prominent research focus and practical trend. Technologies such as intelligent speech recognition, natural language processing, and adaptive learning systems enable learners to acquire English more efficiently and personalized. However, human-computer trust—a critical factor influencing learning outcomes—has yet to receive adequate attention. This trust not only forms the core of human-computer interaction but also directly determines learners' acceptance and reliance on AI systems. Studies indicate that trust levels significantly influence learners' behavioral choices and psychological states, thereby affecting the quality and efficiency of the learning process. Consequently, when evaluating the practical effectiveness of AI-assisted English learning, the importance of human-computer trust cannot be overlooked.

1.2 Problem Statement

While the importance of human-computer trust in AI-assisted learning has been acknowledged in some studies, there remains a lack of systematic exploration into how this trust specifically influences AI-driven deep learning for English acquisition.

Current literature predominantly focuses on defining the concept of human-computer trust or conducting empirical analyses from single dimensions, with no significant breakthroughs achieved regarding its multi-level mechanisms within English deep learning. Furthermore, the varying levels of trust demonstrated by different learners when using AI-assisted learning tools and the underlying reasons for these differences remain inadequately explained. This research gap limits our comprehensive understanding of the operational mechanisms of human-computer trust and hinders further optimization of AI educational technologies. To address this, this study aims to fill the existing research void by thoroughly analyzing the influence mechanisms of human-computer trust on AI-assisted deep learning for English, thereby providing new perspectives for advancing relevant theoretical frameworks.

2. Literature Review

2.1 Human-Machine Trust-Related Theories

Human-computer trust, as a pivotal issue in the social application of artificial intelligence technologies, provides a crucial theoretical foundation for research in human-computer interaction through its conceptual framework and constituent elements. According to definitions in the literature, human-computer trust refers to users' 'positive expectations regarding an AI system's capabilities, reliability, and intentions—expectations that directly influence their willingness to rely on the system for task completion. Structurally, human-computer trust comprises three dimensions: capability trust, integrity trust, and benevolent trust. Capability trust evaluates the system's technical proficiency in performing specific tasks; integrity trust assesses behavioral consistency and transparency; while benevolent trust involves subjective judgments about whether the system prioritizes user interests. Furthermore, the active reasoning theory emphasizes that trust formation depends not only on the system's external performance but also on users' internal cognitive processes—including prior knowledge, emotional states, and tolerance for uncertainty—all of which modulate trust levels. These theoretical frameworks establish a solid foundation for understanding the essence and dynamic mechanisms of human-computer trust.

2.2 Current Research Status of AI-Assisted English Learning

In recent years, with the rapid advancement of artificial intelligence technology, AI-assisted English learning has become a hot topic in educational technology research. Scholars worldwide have extensively explored the application models and learning outcomes of AI in English education. Regarding application approaches, existing research primarily focuses on intelligent speech recognition, adaptive learning systems, and natural language processing-based conversational robots. For instance, intelligent speech recognition technology is widely used in oral English training to provide real-time feedback that helps learners improve pronunciation accuracy, while adaptive learning systems analyze learners' behavioral data to recommend personalized learning paths, thereby enhancing learning efficiency. In terms of learning outcomes, multiple empirical studies have demonstrated that AI-assisted English learning significantly improves learners' vocabulary size, grammar proficiency, and listening comprehension skills. However, although these findings highlight the potential value of AI technology in English learning, most studies remain limited to optimizing surface-level learning tasks, with fewer investigations focusing on its effectiveness in deep learning scenarios.

3. Analysis of the Mechanism by Which Human-Machine Trust Influences AI-Assisted English Deep Learning

3.1 At the level of learning motivation

3.1.1 Trust and Intrinsic Motivation

Learners' trust in AI plays a crucial role in stimulating their intrinsic learning motivation. Intrinsic motivation typically stems from an individual's interest or enjoyment in the activity itself, rather than being driven by external rewards. When learners develop trust in AI-assisted systems, they are more likely to view the AI as a reliable learning partner, thereby enhancing their curiosity and willingness to engage in English learning tasks. For example, if learners believe that AI can provide accurate and personalized learning recommendations, they may be more inclined to explore new language learning materials, such as complex grammatical structures or authentic expressions. This trust not only reduces cognitive load during the learning process but also strengthens learners' intrinsic interest through positive emotional experiences. Furthermore, research

indicates that trust significantly boosts learners' enthusiasm, leading to greater focus and persistence throughout the learning journey. Therefore, the role of human-AI trust in cultivating intrinsic motivation cannot be overlooked, as it lays a vital psychological foundation for deep learning.

3.1.2 Trust and Extrinsic Motivation

Beyond intrinsic motivation, trust profoundly influences the formation of extrinsic motivation. Extrinsic motivation is typically driven by external factors such as academic improvement, reward acquisition, or social recognition. When learners utilize AI-assisted English learning, trust significantly shapes their expectations regarding the external rewards offered by the AI system, thereby modulating their learning drive. Specifically, when learners believe the AI system is efficient and reliable, they are more likely to anticipate achieving desired learning outcomes—such as improved exam scores or substantial language proficiency gains—from the system. These expectations further motivate learners to exert effort toward these goals. Additionally, trust alleviates learners' anxiety about external evaluations, enabling them to focus more on the learning process itself rather than solely on outcome-oriented metrics. Thus, trust serves not only as a catalyst for intrinsic motivation but also as a crucial moderating variable for extrinsic motivation, playing a pivotal role when learners engage in AI-assisted learning tasks.

3.2 Application of Learning Strategies

3.2.1 Trust and Cognitive Strategies

Trust plays a pivotal role in learners' selection and application of cognitive strategies. Cognitive strategies refer to the specific methods learners employ during information processing, including memory retention, comprehension, and application techniques. When learners have high trust in AI-assisted systems, they tend to rely more heavily on the learning resources and guidance provided by these systems, thereby optimizing their own cognitive strategies. For instance, during vocabulary acquisition, highly trusted learners may more frequently utilize AI-recommended memory techniques such as associative memory or contextual memory to enhance vocabulary mastery efficiency. Moreover, trust facilitates learners' understanding of complex linguistic phenomena. Research indicates that trust enhances learners' information processing capabilities, encouraging them to employ diverse cognitive strategies when tackling challenging tasks and thereby improving learning outcomes. Thus, human-computer trust not only influences learners' strategy selection but also positively impacts the practical effectiveness of their cognitive strategies^[1].

3.2.2 Trust and Metacognitive Strategies

Metacognitive strategies involve learners' planning, monitoring, and regulating of the learning process, serving as a crucial component of deep learning. Trust plays a pivotal role in implementing these strategies. When learners have full confidence in AI-assisted systems, they are more inclined to follow the system's recommendations for developing study plans and actively track their progress during learning. For instance, if learners believe the AI can accurately assess their language proficiency and provide targeted improvement suggestions, they may adhere more rigorously to their study plans and promptly adjust strategies when encountering difficulties. Furthermore, trust enhances learners' self-reflection capabilities, enabling them to identify issues more effectively and implement corrective measures. Research shows that learners with high trust levels demonstrate greater flexibility and adaptability in applying metacognitive strategies, laying a solid foundation for improving long-term learning outcomes. Thus, trust not only drives cognitive strategies but also serves as a vital prerequisite for their effective implementation.

3.3 Learning Outcomes Level

3.3.1 Short-term Learning Outcomes

Human-computer trust exerts a particularly significant impact on learners' short-term acquisition of English knowledge. Short-term learning outcomes typically manifest as rapid improvements in fundamental language skills such as vocabulary and grammar. When learners maintain high trust in AI-assisted systems, they are more inclined to actively engage in recommended learning activities and achieve noticeable progress within a short timeframe. For instance, AI-powered vocabulary learning tools can help learners rapidly expand their vocabulary through personalized exercise designs, with trust further enhancing the effectiveness of these tools. Additionally, trust facilitates learners' understanding and mastery

of grammatical rules. Research indicates that learners with high trust levels demonstrate greater accuracy in identifying linguistic structures and achieve higher correct rates during grammar practice when using AI-assisted systems. Thus, human-computer trust primarily contributes to efficient improvement of foundational language skills in short-term learning, laying essential knowledge groundwork for subsequent advanced learning^[2].

3.3.2 Long-term Learning Outcomes

In the long run, human-computer trust profoundly influences the comprehensive enhancement of learners' English proficiency and the development of effective learning habits. Long-term learning outcomes encompass not only improvements in overall language skills such as oral fluency and reading comprehension, but also the establishment of stable behavioral patterns during the learning process. When learners maintain sustained trust in AI-assisted systems, they are more likely to persist with their use for extended periods, gradually cultivating sound learning habits. For instance, AI-powered speaking training tools provide real-time feedback to address pronunciation issues, while trust encourages frequent usage, leading to significant long-term improvement in oral expression. Furthermore, trust strengthens learners' ability to handle complex linguistic materials, resulting in higher accuracy and deeper understanding in reading comprehension tasks. Thus, human-computer trust serves not only as a critical guarantee for short-term learning effectiveness but also as the core driving force behind sustained learning capability enhancement, creating favorable conditions for learners' holistic development^[3].

4. Strategies to Enhance Human-Machine Trust

4.1 AI Technology Optimization

4.1.1 Improve Transparency

Enhancing transparency serves as a crucial strategy for strengthening learners' trust in AI systems. By disclosing the fundamental principles and learning processes of AI algorithms, learners gain clearer understanding of how these systems operate and the rationale behind their decisions, thereby reducing uncertainties that may cause doubt. For instance, in AI-assisted English learning systems, developers can visualize algorithmic workflows—such as generating feedback or recommending learning resources based on user inputs—through intuitive interfaces. Additionally, providing detailed explanations about data sources and processing methods helps build learners' confidence in the system. Research shows that perceived system transparency significantly boosts users' trust levels, positively impacting both usage willingness and learning outcomes. Thus, improving transparency is not merely a technical optimization but a pivotal approach to fostering human-machine trust.

4.1.2 Enhancing Interpretability

Interpretability refers to an AI system's ability to explain its outputs or recommendations in a manner understandable to humans. In AI-assisted English learning scenarios, learners typically rely on AI-generated feedback to adjust their learning strategies or improve methods. If such feedback lacks interpretability, learners may develop skepticism, thereby reducing trust in the AI. To enhance interpretability, researchers have proposed various techniques—such as using natural language generation to convert complex algorithmic results into clear textual explanations, or employing charts and examples to illustrate recommended learning paths and their rationale. Additionally, designing interactive explanation features that allow learners to actively inquire about the reasoning behind AI decisions has proven effective in boosting user confidence. Thus, improving the interpretability of AI systems is not only an inevitable requirement of technological advancement but also a crucial pathway for fostering robust human-AI trust relationships^[4].

4.2 Improvement of Teaching Design

4.2.1 Personalized Learning Design

Personalized learning design stands as a pivotal strategy for enhancing learners' trust in AI-powered educational systems. By analyzing individual learner characteristics—including language proficiency, learning styles, and interests—the AI system tailors content and learning pathways to each user, thereby boosting both relevance and effectiveness. Research demonstrates that learners experience significantly increased trust when perceiving the AI system's attention to and understanding of their unique needs. For instance, in AI-assisted English learning, the system dynamically adjusts course difficulty and content based on learners' vocabulary and grammar mastery, ensuring optimal learning conditions at all times. Furthermore, by

tracking learners' progress and preferences, personalized learning designs continuously refine recommendation algorithms, further enhancing engagement and satisfaction while strengthening the human-machine trust relationship^[5].

4.2.2 Interactive Design

Interactive design plays a crucial role in enhancing learners' trust in and engagement with AI systems. By incorporating interactive elements between AI and learners, it effectively reduces feelings of unfamiliarity and alienation toward AI systems, making learners more receptive to and reliant on AI support. For instance, in AI-assisted English learning systems, real-time dialogue features enable learners to practice language skills through simulated conversational scenarios. Furthermore, diverse interactive formats such as Q&A sessions and gamified tasks not only spark learners' interest but also facilitate their adaptation to AI-enhanced learning environments. Research demonstrates that highly interactive AI systems significantly improve learners' participation, satisfaction, and trust in the system. Therefore, integrating interactive elements into instructional design serves as an effective approach to foster human-AI trust.

4.3 Learner Guidance

4.3.1 Training and Education

Training and education serve as vital tools for helping learners understand AI technology and utilize AI-assisted learning effectively. Through structured training programs, learners gain comprehensive insights into the fundamental principles, functional features, and real-world applications of AI technologies, thereby dispelling misconceptions and biases about AI. For instance, in AI-powered English learning courses, participants can learn how to employ AI systems for pronunciation correction, vocabulary expansion, and grammar practice, with hands-on demonstrations of their practical applications. Additionally, such training equips learners with essential skills for effective interaction with AI systems—such as formulating clear questions and interpreting AI feedback. Research indicates that well-trained learners demonstrate higher levels of trust and greater motivation when utilizing AI-assisted learning. Therefore, enhancing training and education is not only crucial for improving learners' technological literacy but also a key safeguard for fostering human-AI trust.

4.3.2 Psychological Guidance

Psychological guidance plays a vital role in helping learners establish reasonable trust expectations. Given the complexity of human-machine trust, learners may experience compromised learning outcomes due to either excessive or insufficient trust. To prevent both trust abuse and trust deficiency, researchers recommend employing psychological interventions to foster a scientific understanding of AI systems among learners. For instance, mental health education programs can promote the concept of "moderate trust"—encouraging learners to maintain critical thinking while relying on AI and avoid blindly accepting its recommendations. Furthermore, psychological guidance assists learners in managing distrust arising from technical failures or unexpected situations, thereby maintaining the stability of human-machine trust relationships. Studies indicate that learners receiving psychological guidance demonstrate greater psychological resilience and adaptability when facing technical challenges, along with more robust trust in AI systems. Therefore, psychological guidance should be regarded as a crucial complementary strategy for enhancing human-machine trust, working synergistically with technological advancements and optimized instructional design to form a comprehensive trust-building framework^[6].

5. Conclusion

This study systematically analyzes the mechanisms by which human-computer trust influences AI-assisted English deep learning, revealing its multifaceted effects on learning motivation, strategy application, and learning outcomes. The findings demonstrate that learners' level of trust in AI significantly impacts their intrinsic and extrinsic learning motivations, thereby either enhancing or inhibiting their learning engagement. Moreover, trust levels determine learners' preferences for employing cognitive and metacognitive strategies when utilizing AI, further influencing their ability to manage the learning process. Notably, human-computer trust not only facilitates short-term acquisition of English knowledge but also enhances learners' overall language proficiency through long-term habit formation. These insights provide a novel perspective on the role of human-computer trust in education, underscoring its central position as a pivotal variable in AI-assisted learning.

Key research findings indicate that trust abuse and trust deficiency may respectively lead to excessive reliance on AI and refusal to use AI, with both extremes negatively impacting learning outcomes. Therefore, establishing an appropriate level

of human-AI trust is a crucial prerequisite for optimizing AI-assisted English learning. This study empirically validates the aforementioned hypotheses and proposes concrete strategies for optimizing AI technology, improving instructional design, and guiding learners, aiming to provide theoretical support for practical applications.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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