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Research and Practice on Artificial Intelligence Empowering College English Learning Strategies

Yimin Zhang

Rocket Force University of Engineering, Xi'an, Shaanxi, China

Abstract: As the core factor determining the effectiveness of college students' autonomous English learning and the cultivation of lifelong foreign language learning ability, learning strategies play a decisive role in improving comprehensive English literacy. Based on constructivist learning theory, autonomous learning theory, and intelligent education theory, this study systematically sorts out the practical dilemmas of current college students' English learning strategies, explains the internal operation mechanism of artificial intelligence empowering the optimization of English learning strategies, and constructs a three-dimensional practical system of "technology empowerment-strategy iteration-capability advancement". Combined with quasi-experimental teaching data in universities, this study verifies the effectiveness of the constructed model and puts forward targeted practical paths for artificial intelligence empowering college English learning. The research aims to solve the pain points of traditional autonomous English learning, provide theoretical support and practical reference for the intelligent teaching reform of college English and the cultivation of students' personalized autonomous learning ability, and promote the high-quality development of college English education.

Keywords: Artificial Intelligence; College English; Learning Strategies; Autonomous Learning; Intelligent Teaching.

1. Introduction

College English Teaching Guide (2020 Edition) [1] clearly points out that college English teaching should deeply integrate modern information technology, build a new intelligent, personalized and autonomous teaching ecosystem, and focus on cultivating students' comprehensive English application ability and lifelong autonomous learning ability. In the context of the comprehensive penetration of artificial intelligence technology in the field of education, the learning scenarios, resource forms, interaction modes and evaluation systems of foreign language education have undergone subversive changes, completely breaking the single learning pattern dominated by traditional classroom teaching. Compared with the traditional teaching mode, intelligent education has the unique advantages of teaching students in accordance with their aptitude, real-time feedback, dynamic adaptation and data empowerment, providing a new carrier for students to optimize learning methods, iterate learning strategies and improve learning efficiency.

For a long time, college English teaching has mostly adopted a standardized teaching model with unified progress, unified content and unified evaluation, ignoring individual differences in students' academic conditions. Most college students rely on classroom lectures for English learning, lacking the autonomous learning awareness of active planning, self-monitoring and resource integration. The three core learning strategies of cognition, metacognition and resource management are not applied scientifically and standardizedly. Common problems such as mechanical memorization, blind question brushing and fragmented learning lead to an imbalance between learning investment and output, and the problems of "dumb English" and "exam-oriented English" have not been fundamentally solved. At the same time, college English teachers face the problems of large class capacity and heavy teaching tasks, making it difficult to provide targeted strategy guidance for each student. Students' learning strategies are mostly accumulated through groping independently without systematic and professional training, resulting in slow improvement of autonomous learning ability.

The popularization and application of artificial intelligence technology effectively makes up for the shortcomings of traditional college English learning and teaching. It realizes accurate empowerment of the whole process of students' learning through big data academic diagnosis, intelligent accurate resource push, human-computer multimodal interaction and whole-process dynamic evaluation. From the perspective of intelligent education development, this study focuses on the core issue of optimizing college English learning strategies, explores the internal logic, practical dilemmas and practical paths of AI-enabled English learning strategy upgrading through theoretical research and teaching demonstration, and constructs a replicable and promotable intelligent English learning model, so as to boost the high-quality reform and development of college English teaching.

2. Core Concepts and Theoretical Basis

2.1. Definition of Core Concepts

2.1.1. College English Learning Strategies

College English learning strategies refer to a series of systematic methods, behaviors and regulation means actively adopted by learners in the whole process of English learning to achieve learning goals and improve learning efficiency, which are the core components of autonomous learning ability. According to the mainstream academic classification standards, college English learning strategies are mainly divided into three dimensions: cognitive strategies, social-interactive strategies and affective strategies, which support and coordinate with each other. Cognitive strategies focus on language knowledge processing, including contextual vocabulary memory, grammar system combing, discourse logic analysis, and the application of reading, writing and translation skills. Social-interactive strategies refer to the intentional behavioral measures that learners take to promote language learning through interpersonal communication and

social interaction. Affective strategies are learner's deliberate regulatory approaches to manage emotions, attitudes and psychological states in language learning contexts.

2.1.2. Artificial Intelligence Empowered English Learning

Artificial intelligence empowered English learning is not a simple superposition of technical tools, but an all-round reconstruction and optimization of the resource system, learning process, evaluation mechanism and learning strategies of English learning relying on machine learning, natural language processing, big data analysis and multimodal interaction technology. Its core characteristics are personalization, dynamics, real-time performance and interactivity. It can accurately capture students' academic differences, dynamically adapt to learning rhythms, timely feedback learning loopholes, and intelligently match learning resources, promoting the transformation of students' English learning from passive knowledge reception to active ability construction, and realizing the in-depth integration of technology empowerment and learning quality improvement.

2.2. Theoretical Basis

2.2.1. Constructivist Learning Theory

Constructivist learning theory emphasizes that the essence of learning is a process in which learners actively explore, integrate knowledge and construct cognitive systems based on original cognitive experience, highlighting the subjectivity of learners, the situational and interactive nature of the learning process (Piaget, 1970[7]; Vygotsky,1978[8]). Traditional English learning lacks immersive situations and independent exploration space, leading to passive knowledge construction. Artificial intelligence technology can create real English application situations through multimodal forms such as pictures, texts, audios and simulated scenario dialogues, build a human-computer interactive exploration platform, support students to actively sort out knowledge, explore problems and optimize learning strategies, which is highly consistent with the core educational concept of constructivism.

2.2.2. Autonomous Learning

Autonomous learning theory takes learners' self-regulation as the core, requiring learners to have comprehensive abilities of independent planning, process monitoring, self-evaluation and strategy optimization (Zimmerman, 2002[9]; Little,2007 [4], & Littlewood,1999[5]). In traditional college English learning, students' autonomous learning lacks scientific guidance, with random strategy application and weak self-regulation ability. Intelligent artificial intelligence platforms can accurately locate students' strategy shortcomings and provide personalized guidance schemes through data monitoring, academic diagnosis, task decomposition and review summary, helping students form standardized and scientific autonomous learning modes.

2.2.3. Intelligent Education

The core of intelligent education theory is to reconstruct the education and teaching mode relying on artificial intelligence technology, solve the problems of homogenization and inefficiency in traditional education, and realize teaching students in accordance with their aptitude and precise education (Luckin, 2018[6]; Huang, Li & Hu, 2021[2];Leal Filho, W., et al[3], 2025). Adhering to the core principle of "technology serving education", this theory emphasizes adapting technology to individual differences of students, accurately matching students' learning foundation, learning habits and ability shortcomings, and provides a solid theoretical support for the cultivation of personalized learning strategies and the implementation of hierarchical teaching, which is the core guiding theory for AI-enabled college English teaching reform.

3. Current Dilemmas in the Application of College English Learning Strategies

3.1. Solidified and Single Cognitive Strategies with Insufficient Refined Knowledge Processing

Most college students have obvious solidified and extensive problems in English cognitive strategies, lacking systematic and refined knowledge processing methods. In vocabulary learning, students generally rely on traditional mechanical repetitive recitation, ignoring scientific memory strategies such as contextual association, root affix connection and scenario application, resulting in fragmented vocabulary memory, high forgetting rate and difficulty in applying knowledge flexibly. In reading and writing learning, students lack special strategies for discourse analysis, logic sorting, sentence iteration and error tracing. Reading comprehension is limited to literal translation, unable to deeply interpret discourse themes and logical frameworks, while writing is plagued by single sentence patterns, confused logic and frequent Chinglish expressions. In listening and speaking training, there is a lack of scientific methods such as immersive reading, intelligent pronunciation correction and language sense accumulation, leading to weak listening discrimination ability and rigid oral expression. On the whole, students' cognitive strategies lack adaptability, failing to adjust learning methods flexibly according to different learning modules, resulting in low learning efficiency.

3.2. Weak Social-interactive Ability and Incomplete Autonomous Learning Closed Loop

The lack of social-interactive ability is the core bottleneck restricting the improvement of college students' autonomous English learning quality. In terms of social-interactive ability, most students lack the motivation to interact with the peers combined with their own English foundation, examination preparation needs and ability shortcomings, leading to blind autonomous learning. In the learning process, students generally lack the awareness of the peer evaluation and cooperation, difficult to accurately discover their weaknesses in vocabulary, grammar, listening, speaking, reading and writing, resulting in disordered learning process. In general, students' autonomous learning is highly dependent on teacher supervision, failing to form a closed-loop learning mode of "planning-monitoring-reflection-optimization", and their autonomous learning literacy needs to be improved urgently.

3.3. Low Utilization Rate of Intelligent Technology

With the enrichment of various English learning resources and intelligent tools in the information age, students' ability of using intelligent tools generally lags behind the development speed of technology. Students' application of artificial intelligence learning tools is superficial. They are

only proficient in basic functions such as vocabulary recitation and simple question brushing, with extremely low utilization of high-order core functions such as intelligent pronunciation correction, writing correction, academic analysis, strategy guidance and error sorting, failing to make full use of technical tools to optimize learning strategies and make up for ability shortcomings, so that the value of technology empowerment cannot be fully released. At the same time, most students have weak time management ability, with fragmented and irregular English learning, making it difficult to form a long-term learning mechanism.

3.4. Lack of Personalized Guidance and Professional Support for Strategy Optimization

The homogenization characteristics of traditional class teaching mode lead to the lack of accurate and professional guidance support for students' learning strategy optimization. Restricted by multiple teaching classes, large number of students and heavy teaching tasks, college English teachers cannot fully grasp each student's learning habits, academic shortcomings and strategy defects, so it is difficult to carry out one-to-one personalized strategy guidance. At the same time, traditional classroom teaching focuses on language knowledge teaching, lacking systematic explanation and special training of learning methods and learning strategies. Students lack professional strategy learning channels and can only accumulate experience through independent exploration, resulting in non-standard and unscientific learning strategies. It is difficult to realize personalized optimization according to individual differences, and students fall into a long-term inefficient learning cycle.

4. Internal Mechanism of Artificial Intelligence Empowering the Optimization of College English Learning Strategies

4.1. Accurate Academic Portrait Empowers the Refined Upgrading of Cognitive Strategies

Relying on big data analysis technology, artificial intelligence can collect full-process data of students' English learning, covering multi-dimensional information such as vocabulary mastery accuracy, grammar error types, reading answer accuracy, writing sentence defects, oral pronunciation deviations and weak listening question types, so as to construct dynamic and accurate personalized academic portraits. Based on academic diagnosis results, AI systems can accurately make up for students' cognitive strategy shortcomings and achieve precise empowerment. Aiming at students' mechanical vocabulary memory problems, the system pushes situational and contextual vocabulary training materials to guide students to adopt associative and situational memory strategies. For students with weak reading and writing abilities, it intelligently pushes discourse analysis methods, writing logical frameworks and sentence pattern optimization skills to help students build a systematic reading and writing cognitive system. Targeting at listening and speaking weaknesses, it carries out immersive reading and targeted pronunciation correction training based on speech recognition and intelligent pronunciation correction technology, optimizing students' listening and speaking training modes. This fundamentally breaks the traditional solidified and extensive cognitive learning mode and promotes the refined and efficient transformation of cognitive strategies.

4.2. Whole-process Dynamic Monitoring Cultivates Closed-loop Social-interactive Strategies

The core of social-interactive strategies lies in interpersonal communication, social interaction and cooperation. Artificial intelligence provides full-process technical support for the cultivation of students' social-interactive abilities. In the learning process, the system real-timely monitors the learning progress, task completion quality and error distribution rules, dynamically pushing students to communicate on the learning platforms, which contribute to students' overall development. The platform automatically generates visual academic reports, clearly presenting students' learning advantages, weak modules and strategy application problems, and build a closed loop to strengthen students' confidence to promote their English performance.

4.3. Intelligent Accurate Adaptation Optimizes Resource and Time Management Strategies

Based on students' academic data, ability shortcomings and learning goals, artificial intelligence algorithms realize intelligent screening, accurate push and dynamic adaptation of learning resources, thoroughly solving the problems of disordered traditional resources, poor adaptability and low utilization rate. According to students' hierarchical levels, the system accurately pushes personalized resources such as graded reading, special question banks, oral courses, writing materials and bilingual popular science, avoiding the disadvantages of blind resource screening. At the same time, the intelligent platform has the functions of error sorting, knowledge point summary and learning data retention, helping students systematically integrate learning resources, build exclusive personal learning resource libraries and realize accurate review and accumulation. In addition, AI adapts to fragmented learning scenarios, pushes lightweight learning tasks according to students' spare time, and matches learning reminders and clock-in statistics functions, helping students scientifically plan learning time and optimize time and resource management strategies.

4.4. Human-computer Collaborative Interaction Constructs Personalized Autonomous Learning System

Artificial intelligence breaks the limitations of traditional homogenized teaching and builds a human-computer collaborative education system of "teacher-led, AI-empowered and student-centered". On the one hand, intelligent AI assistants realize 24-hour real-time interaction, instantly answering students' various learning questions in vocabulary, grammar, reading, writing and translation, and providing targeted personalized strategy guidance, making up for the shortage of teachers' personalized guidance. On the other hand, multimodal interaction technology creates immersive and interesting English learning scenarios, effectively improving the dull and inefficient problems of traditional learning and stimulating students' initiative in

active learning and exploration. The human-computer collaboration mode realizes the in-depth integration of technology empowerment and student subjectivity, promoting the transformation of students' English learning strategies from passive adaptation to active optimization.

5. Practical Paths of Artificial Intelligence Empowering College English Learning Strategies

5.1. Implement Hierarchical Empowerment to Accurately Optimize Cognitive Learning Strategies

Relying on the academic stratification function of intelligent learning platforms, differentiated cognitive strategy cultivation is carried out according to students' differences in English foundation. For students with weak foundation, focusing on core basic modules such as vocabulary and grammar, the platform pushes lightweight and basic special training, guiding students to adopt cognitive strategies of point-by-point breakthrough and fragmented accumulation to consolidate language foundation. For students at the intermediate level, it focuses on advanced training such as discourse analysis, logical reasoning, sentence pattern application and question type decomposition, cultivating systematic reading and writing cognitive strategies and improving knowledge application ability. For high-level students, it pushes expanded resources such as academic English reading, speculative oral English and creative writing, cultivating high-level exploration and critical thinking strategies. At the same time, with the help of AI error tracing and intelligent correction functions, students are guided to accurately locate cognitive misunderstandings, optimize knowledge processing methods targeted, and comprehensively improve cognitive learning efficiency.

5.2. Build Intelligent Management System to Cultivate Closed-loop Metacognitive Ability

A metacognitive cultivation closed-loop system of "AI-assisted planning-dynamic process monitoring-intelligent review and reflection" is constructed. Firstly, students are guided to set independent learning goals according to personalized needs such as CET-4/6 preparation, postgraduate entrance examination and ability improvement, and the AI system decomposes them into quantitative and implementable daily learning tasks to strengthen independent planning ability. Secondly, relying on the data visualization function of the platform, it real-timely presents learning duration, task completion degree, error rate and knowledge point mastery, helping students intuitively control learning status and strengthen self-monitoring awareness. Finally, the AI regular academic review function is used to sort out students' strategy application shortcomings and knowledge loopholes, guide students to take the initiative to reflect and dynamically adjust learning schemes, form a normalized iteration mechanism of "learning-monitoring-reflection-optimization", and steadily improve metacognitive level.

5.3. Integrate Intelligent Tools to Improve Resource and Time Management Capabilities

Targeted AI tool application guidance is carried out to help students fully release the value of intelligent technology empowerment. In terms of resource management, students are guided to use generative AI tools to customize personalized question banks, writing materials, oral topics and translation exercises to solve the problem of poor adaptability of general resources. AI error sorting and knowledge point archiving functions are used to systematically integrate learning achievements and build personal learning resource libraries for accurate review. In terms of time management, relying on the platform's clock-in reminder, duration statistics and task scheduling functions, students are guided to reasonably allocate learning time for listening, speaking, reading and writing, avoiding ineffective fragmented learning. At the same time, an intelligent collaborative learning community is built to carry out peer mutual evaluation and group exploration activities, optimizing socialized resource management strategies.

5.4. Deepen Human-computer Collaboration to Strengthen Accurate Guidance of Learning Strategies

A normalized human-computer collaborative teaching mode is constructed to make up for the shortcomings of strategy guidance. In classroom teaching, teachers rely on AI big data academic analysis to accurately grasp the overall classroom learning situation and individual students' strategy shortcomings, carry out systematic learning strategy teaching targeted, explain scientific methods such as vocabulary memory, reading problem-solving, writing conception and oral expression, and consolidate students' strategic theoretical foundation. After class, intelligent AI assistants provide one-to-one personalized Q&A and strategy guidance for students, pushing exclusive optimization schemes. At the same time, teachers regularly evaluate students' strategy application effects combined with AI learning data, correct inappropriate learning methods, and form an all-round and three-dimensional strategy cultivation mode of "classroom systematic teaching + after-class intelligent empowerment".

5.5. Improve Intelligent Evaluation to Force Iterative Upgrading of Learning Strategies

Breaking the traditional single summative evaluation mode, an AI-enabled whole-process and multi-dimensional college English learning evaluation system is constructed. The evaluation dimension is no longer limited to examination scores, covering core indicators such as learning strategy application, learning attitude, learning progress, knowledge mastery and ability improvement. The evaluation method is dominated by big data dynamic process evaluation, which records the whole process of students' learning instead of a single final assessment. The evaluation results are presented visually, clearly reflecting the advantages and deficiencies of students' strategy application. Through intelligent evaluation, students can accurately recognize their learning shortcomings and actively optimize learning strategies. Meanwhile, it provides data support for teachers to adjust teaching schemes and optimize guidance strategies, forming a virtuous cycle of "evaluation-feedback-optimization-improvement".

6. Practical Effects and Problem Reflection

6.1. Practical Effects

This study selected 78 non-English major undergraduates from two classes of a university to carry out a one-semester controlled teaching practice. The experimental class adopted the AI-enabled learning strategy cultivation model, while the control class adopted traditional teaching and independent learning mode. The practical results show that the standardization and scientificity of the application of cognitive, social-interactive and resource management learning strategies of students in the experimental class are significantly better than those of the control class, and their autonomous learning awareness and self-management ability are obviously improved. The final test data show that the comprehensive English scores and CET passing rate of the experimental class are higher than those of the control class, and the improvement effect of comprehensive abilities in listening, speaking, reading and writing is remarkable. At the same time, students in the experimental class can skillfully use intelligent tools to optimize learning methods and form a normalized and scientific autonomous learning habit, which fully verifies the feasibility and effectiveness of AI empowering the optimization of college English learning strategies.

6.2. Reflection on Existing Problems

In practical application, artificial intelligence empowering college English learning still has some shortcomings. Firstly, the problem of technology dependence is prominent. Some students over-rely on AI functions such as Q&A, correction and error correction, weakening independent thinking and exploration abilities, which is not conducive to the long-term development of thinking abilities. Secondly, the resources of some intelligent learning platforms are insufficiently adapted to the college English teaching syllabus, and the accuracy of personalized empowerment needs to be further improved. Thirdly, students' digital literacy is uneven. Most students only master basic functions, and the utilization rate of high-order intelligent tools is low. Fourthly, the human-computer collaborative education mechanism is not perfect, teachers' intelligent teaching literacy needs to be improved, and the depth of data-enabled teaching is insufficient.

7. Conclusion and Prospect

7.1. Research Conclusion

The in-depth integration of artificial intelligence and college English learning can effectively solve the core problems of single traditional English learning strategies, weak autonomous management, low resource utilization and insufficient personalized guidance. Through four core mechanisms of accurate academic diagnosis, whole-process dynamic management, intelligent resource adaptation and human-computer collaborative interaction, artificial intelligence comprehensively empowers the iterative upgrading of students' three core learning strategies. The three-dimensional practical system constructed in this study, including hierarchical cognitive empowerment, closed-loop social-interactive cultivation, intelligent resource integration, human-computer collaborative guidance and whole-process intelligent evaluation, can effectively improve college students' autonomous English learning ability and comprehensive language literacy, promote the transformation of college English learning mode from homogeneous passive learning to personalized active learning, conform to the core needs of intelligent teaching reform of college English in the new era, and has good practical and popularization value.

7.2. Future Prospect

The future reform of college English teaching needs to continuously deepen the in-depth integration of artificial intelligence and learning strategy cultivation. On the one hand, strengthen the cultivation of students' digital literacy and critical thinking ability, establish the learning concept of "technology assistance, student subjectivity", and avoid excessive technology dependence. On the other hand, continuously optimize the functions of intelligent learning platforms, develop more targeted strategy cultivation modules combined with the college English teaching syllabus and students' academic characteristics, and improve the accuracy of technology empowerment. At the same time, improve the human-computer collaborative education mechanism, strengthen the training of teachers' intelligent teaching ability, and promote the transformation of teachers from knowledge imparters to strategy instructors and academic analysts. Subsequent research will carry out long-term teaching practice, continuously optimize the AI-enabled English learning system, and help cultivate new-era compound talents with solid foreign language literacy, autonomous learning ability and innovative critical thinking ability.

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