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AI-Enabled Production-Oriented Approach: Construction and Implementation Paths for College English Teaching Design Principles

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Abstract: The Production-Oriented Approach (POA) drives students' learning processes through task-based scenarios. In the context of the deep integration of digital technology and education, AI-enhanced POA can further improve teaching quality. This paper explores the construction of teaching design principles and practical methods for university English teaching under the AI-enabled POA framework. It argues that teachers should base their practices on the theoretical foundations of POA while aligning with the empowering dimensions of AI technology, thereby establishing teaching design principles that focus on goal orientation, human-machine collaboration, data loops, authentic contexts, and dynamic evaluation. In practice, teachers should create a precise teaching-feedback-optimization loop through a teaching management support system that encompasses pre-class, in-class, and post-class activities.

Keywords: College English; AI; Production-Oriented Approach; Teaching design principles; Practical paths

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1. Introduction

The Production-Oriented Approach (POA), developed by Professor Wen Qiufang based on the "Drive-Promote-Evaluate" theoretical framework, emphasizes that language instruction should start with output and be supported by input. Authentic production tasks drive students to actively acquire language knowledge, facilitating the internalization and application of their language abilities. In an era of globalization, implementing POA in university English instruction can cultivate interdisciplinary talent with comprehensive competencies. Furthermore, the increasing intelligence of social development marks a trend where AI technology reshapes the educational ecosystem, prompting university English teachers to explore the potential of AI to empower POA and deepen its implementation. This involves building systematic teaching design principles and actionable strategies to enhance the efficacy of university English teaching [1].

2. Rationale for AI-enabled POA

The integration of AI and POA represents a synergy beyond the mere application of technology in pedagogy; it embodies a coordinated enhancement based on educational principles and technological characteristics. At its core, this synergy reflects a bidirectional coupling of cognitive science and technology. Drawing upon cognitive load theory, AI's capabilities—such as automated grammar error recognition and statistical learning data analysis—significantly mitigate the external cognitive load students experience while learning English. Consequently, students can concentrate their cognitive resources on constructing linguistic logic, adapting to cultural contexts, and achieving higher-level language outputs. Moreover, AI's immediate feedback functionality ensures that students' learning errors are corrected before they are forgotten, accelerating language internalization and aligning with theories related to the "working memory window period." From a socioconstructivist perspective, AI can create virtual simulated environments instead of providing single technical contexts, thereby digitally extending social language. For instance, with its adaptive capabilities, AI can identify individual learners' zones of proximal development (ZPD) boundaries and adjust learning tasks accordingly, continually optimizing the scaffolding provided in AI-assisted learning [2].

Table 1. Levels, pathways, and value of educational technology in empowering teaching and learning

Level of empowerment	Technical implementation	Educational value
Process Optimization	Automated grading, data collection	Allows teachers to focus on instructional design
Cognitive Enhancement	NLP analysis of logical fallacies, VR immersion	Deepens language comprehension
Ecological Reconstruction	Learner profiles, resource matching, and dynamic assessment	Achieves an integrated teaching-learning-assessment ecosystem

From a practical feasibility standpoint, this coordination mainly manifests in the precise breakthroughs AI technology can make to address POA's practical focus and to enhance critical teaching components. Notably, traditional POA instruction grapples with the challenge of personalization in large classes, where teachers struggle to accommodate individual students' varying needs and foundational knowledge. However, AI technology can enable personalized analysis on a large scale through learning analytics systems. For example, AI algorithms can process the learning data of hundreds of students concurrently to identify specific English learning challenges and create tailored profiles for each learner. Concurrently, AI technology promotes output-driven instruction effectively through a feedback loop based on real-time diagnostics of students. For instance, when students complete writing tasks on an intelligent writing platform, the system can highlight grammatical errors, inappropriate vocabulary, and logical issues within three seconds, allowing for immediate revisions to enhance the quality of student outputs. This method reinforces the core characteristic of POA—learning through production—and enhances instructional precision and immediacy, thus enabling personalized, effective teaching in large classroom settings [3].

3. Core principles for AI-POA teaching design construction

AI excels in automating procedures, improving efficiency, ensuring accuracy and reliability, and emphasizing flexibility and adaptability, which empowers the Production-Oriented Approach in three key areas—data-driven analysis, intelligent interaction, and adaptability. For example, AI can collect and analyze data regarding students' vocabulary deficits, types of grammar mistakes, and logical structures in output texts for precise diagnostics. Teachers can optimize teaching strategies based on this data-driven insight, addressing both individualized and precise instructional needs. Additionally, by leveraging technologies such as natural language processing (NLP) and virtual reality (VR), AI can create immersive scenarios—such as international conference speeches or cross-cultural negotiations—and provide real-time feedback on students' language outputs. This environment allows students to learn language skills in a more authentic, practical context, enhancing their language application abilities. Furthermore, AI's adaptive systems can offer customized resources aligned with students' learning pace and capabilities, adhering to the principles of differentiated instruction and stratified teaching. Accordingly, the teaching design principles of university English instruction from the perspective of AI-enhanced POA should include: goal orientation, human-machine collaboration, data loops, authentic contextualization, and dynamic evaluation.

Specifically, the goal orientation principle emphasizes that AI-POA teaching design should be guided by clear language production and communication objectives and dynamically adjusted based on AI analysis of societal talent demand in language proficiency, accommodating various teaching contexts. Under this principle, the core technological pathway for AI-assisted POA is to deepen the alignment between instruction and industry needs. For instance, AI can analyze extensive data from employment trends and industry reports to identify competencies required in the cross-border e-commerce sector, such as effective business communication and product description skills. Teachers can use this information to set production task goals like "write a product introduction compliant with international standards" or "conduct effective cross-border business negotiations", ensuring that students engage with appropriately challenging tasks to enhance efficiency and learning quality.

The human-machine collaboration principle emphasizes that, within AI-POA teaching design, teachers should assume a leading role in the overall planning and management of key instructional processes, while AI handles repetitive tasks such as grammar correction and speech evaluation. For instance, in the design of an English public speaking unit, teachers are responsible for crafting the speech themes and refining evaluation criteria, while AI assesses students' speech content and extracts key terms. Teachers then focus on evaluating the logical structure, emotional expression, and cultural implications of students' presentations, guiding subsequent learning activities and evaluations [4].

Table 2. Complementary and synergistic roles of AI and teachers in instructional tasks

Task type	AI functions	Teacher functions
Routine Skills Training	Grammar correction, pronunciation assessment	Designing evaluation standards
Higher-order Cognitive Development	Providing logical discrepancy reports	Facilitating critical discussions
Emotional and Cultural Understanding	Detecting emotional tendencies in expressions	Interpreting cultural metaphors deeply

The data loop principle emphasizes that the entire process of AI-POA instruction should involve continuous data collection and subsequent iteration and optimization based on AI-generated learning profiles. This process incorporates input data, process data, output data, and feedback data, collectively forming a complete feedback loop. Input data primarily concerns learner engagement, such as the duration of access to specific learning resources and navigation paths. Extended engagement with particular materials often indicates heightened interest in those topics, while navigation paths reveal learners' resource-seeking behaviors. Process data focuses on language discussion terms that see higher usage volumes in collaborative platforms. If students frequently reference terms like "negotiation" and "collaboration" during discussions, this suggests a strong interest in those business negotiation concepts. Output data covers the frequency of cohesive devices and the distribution of pauses in speech, assessing whether written outputs are coherent and logical, as well as the fluency of spoken expression and the continuity of thought. Teachers can then identify weaknesses in students' writing and speaking skills for targeted guidance. Feedback data primarily reflects students' acceptance rates of AI-generated recommendations. High acceptance rates demonstrate that students are actively leveraging AI suggestions to enhance their language skills and indicate the applicability and relevance of AI feedback [6].

For instance, AI should collect data on the duration of student engagement with learning resources during the input phase, monitor writing content, oral production, and translation results during the output phase, and assess student acceptance rates of AI feedback and teacher evaluations for continual improvement. By analyzing and integrating this data, AI constructs unique learning profiles for each student, clearly outlining strengths, weaknesses, and learning habits to support teachers in optimizing instructional decisions.

The authentic contextualization principle advocates for teachers to utilize AI to generate multimedia production-oriented scenarios, enabling students to practice in genuine language environments. This principle allows for the expansion of multimodal technology options, including VR with digital twin technology, emotional AI, and environmental noise incorporation. For instance, VR combined with digital twin technology can simulate real-world occupational settings. Emotional AI can facilitate simulated medical consultations, where systems assess patient pain levels based on nuanced facial expression analysis, allowing student-doctors to adjust their inquiries based on real-time feedback. Additionally, environmental noise incorporation can provide innovative training for language communication skills by presenting students with scenarios where they must communicate amidst distractions from background chatter, enhancing their focus on dialogue partners [6].

The dynamic evaluation principle stresses the establishment of a multidimensional AI evaluation framework that assesses students' language production based on accuracy, effectiveness, and depth of discussion. Evaluation criteria include students' vocabulary usage, grammatical structures, and overall coherence of discourse, along with their ability to convey intent accurately, understand others' messages, and provide appropriate responses. Teachers can visualize this data through capability maps, offering tailored feedback and guidance [7].

Table 3. Application scenarios and data interfaces for multi-dimensional evaluation data visualization tools

Tool	Applicable scenarios	Data input
Python Matplotlib	Highly customizable contexts	JSON-formatted dimensional scores (e.g., {"innovation":65})
Tableau	Rapid visualization	Excel files (student names + dimensional score columns)
Buil*t*-in Teaching Management System	Standardized evaluation	Directly linked to the AI analysis module API

Through this analysis, it is evident that the goal orientation principle serves as the navigational compass of the entire system, establishing the direction and value benchmarks for teaching activities while ensuring that other principles effectively and efficiently service the achievement of educational objectives. Specifically, this principle delineates responsibilities in human-machine collaboration, provides analytical grounds for data loops, defines types of authentic contexts, and establishes the baseline for dynamic evaluation. The human-machine collaboration principle constitutes the core methodology for achieving goal orientation, facilitating the unity of instructional efficiency and humanistic value. It also drives the creation of authentic contexts, establishes data loops, and executes dynamic evaluations. The authentic contextualization and data loop principles encapsulate the direct embodiment of AI-enabled teaching, serving as the dual wings to enhance the efficacy of POA: they ignite students' interest in language production through external empowerment while transitioning instruction from an empirical basis to a data-driven scientific decision-making process. Moreover, the authentic contextualization and data loop principles are closely interlinked; the context informs the data loop, while the findings from data analysis can improve contextual experiences. Finally, the dynamic evaluation principle operates as a continuous diagnostic tool, directly supporting the goal orientation principle while heavily relying on human-machine collaboration and data analysis. The content evaluated stems from students' performance in real contexts, with results generating tailored contexts for future interactions [8].

4. Implementation strategies for the AI-POA teaching model

4.1. Intelligent pre-class initiatives

Following the establishment of AI-POA teaching design principles, teachers must implement intelligent segments throughout the pre-class, in-class, and post-class processes, integrating a robust teaching management support system to ensure the efficient achievement of instructional goals. In the pre-class stage, teachers should first utilize AI to identify student needs accurately, generating personalized production tasks based on learning data and supplying relevant input materials as foundational resources. For example, teachers can deploy a self-developed intelligent diagnostic system for English learning needs to deliver smart questionnaires to incoming students. These questionnaires may explore various dimensions, including motivational tendencies, academic requirements, current vocabulary levels in reading and listening, and challenges in speaking and writing. AI, leveraging natural language processing techniques, can analyze questionnaire responses and analyze students' professional backgrounds to create individualized learning profiles.

If a student indicates in the questionnaire an interest in reading English-language medical journals, AI can categorize them under academic English in the medical domain and generate a personalized task, such as "write an English abstract for a medical case." Conversely, if a student states a goal of communicating at an international trade fair, the corresponding output task could involve "simulating product recommendations in English for the fair." The input materials provided to students should closely align with these tasks, encompassing various journals, conference presentation videos, negotiation case templates, product manuals, and dialogs typical of cross-cultural communication. Teachers should intervene promptly based on mutual feedback from AI and students, offering more personalized guidance to help students efficiently prepare for pre-class tasks. For example, if AI shares articles from high-impact journals relevant to students focusing on academic writing, teachers could highlight sections within those articles that align with student vocabulary and grammatical difficulty levels [9].

Simultaneously, teachers can direct AI to clarify the communication and language objectives embedded within instructional materials. During this process, AI can extract contextual elements from the materials, analyze the core intent behind the proposed tasks, and suggest learning objectives accordingly. For instance, simulating dialogues with various customer negotiation styles can allow students to rehearse communication strategies. In terms of language objectives, AI's vocabulary and grammar training modules can play a significant role. After analyzing the materials, AI will identify critical terms, phrases, and specific grammatical structures, subsequently proposing interactive tasks to reinforce vocabulary retention, identify grammatical errors in target sentences, and encourage students to frame similar scenarios using newly acquired vocabulary and structures. Teachers can task AI with tracking student self-study data in pre-class assignments to assess the attainment of learning objectives and to derive insights for optimizing instructional strategies.

4.2. Intelligent facilitation in class

The in-class segment represents a crucial transition phase where language production skills shift from input to internalization. This stage requires real-time support from AI tools alongside timely teacher interventions at critical moments to achieve synergy between technological empowerment and teacher guidance. In terms of tool support, teachers should select relevant platforms based on the needs of different language skills. For instance, during writing instruction, teachers may utilize a collaborative framework comprising Grammarly and ChatGPT, while during speaking instruction, they can leverage AI tools such as iFlytek's Spark virtual dialogue platform, integrating real-time emotional analysis to create scenarios closely aligned with output tasks.

Teacher interventions should center on addressing deeper issues that AI cannot manage autonomously, providing students with timely assistance. As an illustration, when students engage in group discussions surrounding consumer rights disputes over imported toy products purchased via cross-border e-commerce, the background setting involves quality issues leading to refund requests. Upon encountering a stalemate in their discussions, AI tools can monitor speech frequency and discern a notable decline in recurring terms like "refund." Moreover, AI's emotional analysis capabilities may detect rising frustration in certain group members' tones. Based on these insights, AI can suggest remedial phrases, such as "I propose a partial refund of 30% to resolve this", redirecting the group's dialogue. In parallel, teachers, observing the breakdown in discussion, can retrieve visual data pertaining to group interactions. Should visualizations reveal that students are spending excessive time on liability assessment, the teacher can approach the group to analyze why discussions have stalled and recommend a shift toward discussing possible solutions, helping students reorganize their thought processes.

4.3. Intelligent evaluation after class

If in-class evaluations prioritize real-time corrections of language production—including immediate identification of grammatical errors by AI and prompt guidance from teachers for logical discrepancies—post-class evaluation shifts the focus toward systematic review of students' learning outcomes and long-term tracking. At this stage, AI's role can be realized through three tiers, ensuring evaluation depth and breadth. The first tier involves jointly creating evaluative standards between teachers and students. Teachers can utilize AI's data analysis capabilities to compile common issues in students' language outputs. Coupled with specific grammar mistakes, cultural misunderstandings, curriculum goals, and industry language demands, a preliminary list of evaluation criteria can be established. These criteria may encompass linguistic accuracy, content relevance, and cultural appropriateness. Subsequently, teachers can facilitate discussions and votes among students to revise these preliminary criteria collaboratively, with AI capturing real-time feedback for dynamic adjustment of evaluation metrics.

The second tier focuses on clarifying collaborative approaches with AI, leveraging its objective strengths while harnessing teachers' subjective insights to form a comprehensive evaluative feedback loop. Specifically, AI can employ natural language processing to analyze students' writing, oral recordings, and translation assignments quantitatively. Teachers would then assess facets beyond AI's recognition capabilities, evaluating aspects such as the coherence of arguments, originality of insights, sensitivity to cultural taboos, and self-awareness regarding personal shortcomings addressed in post-class summaries. The third tier involves constructing and managing digital portfolios for students, facilitating long-term tracking of learning states, and providing personalized feedback. Utilizing a teaching management system, teachers can enable automatic integration of periodic evaluation data, longitudinal progression information, and resource correlation data into the digital portfolios. All records are updated in real-time, allowing teachers to periodically analyze strengths and weaknesses for instructional adaptation. Simultaneously, students can independently view their digital portfolios to clarify areas for improvement.

For instance, after engaging with internet-based oral proficiency assessment systems, students may accomplish tasks like "simulate customs clearance questions at an airport." The system will evaluate their performance across elements such as pronunciation clarity, language fluency, and completeness of content, generating a breakdown of errors. Students can utilize learning dashboards to gain visual insights into their knowledge retention, strengths, and weaknesses, enabling targeted retrieval of suitable resources from the learning repository. Additionally, teachers can review visualized reports from AI assistants, using data analysis to refine instructional priorities while accumulating empirical support for subsequent course iterations [10].

4.4. Privacy protection and algorithmic fairness

As outlined in previous sections, the fundamental logic of AI-enabled POA revolves around algorithmic processing of various data types. Therefore, compliance with data acquisition and fairness in algorithms directly influences the effectiveness of this empowerment. Thus, university English teachers must consider three considerations: First, implement the "minimum necessary principle" to collect data that directly relates to instructional objectives, such as writing outputs, oral recordings, and browsing records of the learning resource library, while avoiding irrelevant accesses like social chat records. Second, apply homomorphic encryption algorithms to facilitate data utility without visibility, allowing for specific computational operations on encrypted data without prior decryption. As for data storage, teachers should utilize blockchain systems to maintain real-time logs of data access, ensuring that any data transactions remain traceable. Additionally, AES-256 encryption standards should be employed for securely storing and transmitting data. After a year following course completion, systems should automatically anonymize data to mitigate risks associated with prolonged data retention.

Secondly, teachers should adopt causal inference algorithms to identify potential systemic biases in AI assessments across various demographics, including gender, major, and language proficiency. Establishing "algorithm-human" dual-validation processes is also crucial. Initial evaluation models generated by AI based on historical data should subsequently undergo random audits by cross-disciplinary teams of educators to mark contentious evaluations and subsequently refine algorithm parameters from feedback. Last, it is essential for educators to avoid falling into the trap of technology replacing human input, constructing a collaborative ecosystem that emphasizes "AI-precision support + teacher-guided pedagogical leadership." Frequent reliance on AI should be mitigated to safeguard independent critical thinking among students. For example, educators should regularly participate in digital literacy enhancement training to grasp AI technology principles, thereby clarifying the division of labor between human expertise and AI resources.

5. Conclusion

In summary, this study asserts that the Production-Oriented Approach is an effective strategy to overcome the limitations of traditional university English teaching models and enhance instructional quality. The integration of artificial intelligence further refines this approach, lending precision and efficacy. Consequently, instructors can construct teaching principles founded on the core tenets of POA and the robust advantages of AI. These principles should encompass goal orientation, human-machine collaboration, data loops, authentic contexts, and dynamic evaluation, addressing issues such as personalization deficits, delayed feedback, and a lack of diverse learning scenarios in traditional university English instruction. In practical teaching contexts, educators must adhere to these principles, leveraging AI tools like Questionnaire Star and iFLYTEK speech evaluation for generating learner profiles and providing real-time pronunciation feedback, thus contributing to the development of a new English instructional ecosystem suited to the demands of the intelligent era.

Nevertheless, current research presents two limitations: firstly, AI technology's capacity for emotion synthesis and cultural interpretation remains inadequate, especially concerning the accurate simulation of complex human emotional responses within virtual environments and the effective recognition of nuanced value differences and non-verbal signals in cross-cultural communication. Secondly, there is a need for enhancement in teachers' digital literacy. Many veteran educators still operate at a basic level in utilizing AI tools, preventing them from fully harnessing technology for reconstructing teaching ecosystems. Future research could address these limitations in two ways: by exploring ongoing advancements in generative AI and affective computing technologies to uncover more intelligent tool forms, and by fostering specialized training initiatives aimed at enhancing educators' skills in AI data analytics and algorithmic optimization, ultimately deepening the integration of human-machine collaboration from operational to practical pedagogical levels.

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