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Exploring Pluralistic Practice in Digital and Intelligent Teaching of University Foreign Language from the Perspective of Educational Ecology

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Abstract: From the theoretical perspective of educational ecology, this study focuses on the pluralistic practices of teachers and students in university foreign language teaching. The results indicate that the pluralistic practice model centered on the "five-step ecological teaching pathway" can effectively improve students' academic performance, enhance the classroom ecology, cultivate students' critical awareness in using AI, and generate positive learning transfer effects. The key to successful digital teaching lies in teachers' transformation from "technology users" to "ecological designers," alongside the cultivation of students' critical thinking abilities. This research provides an actionable practical framework for digital foreign language teaching in higher education.

Keywords: Educational ecology; Foreign language; Digital and intelligent teaching; Pluralistic practice

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1. Introduction

Against the backdrop of the national educational digitalization strategy and the Overall Layout Plan for Digital China Construction, artificial intelligence (AI) is pivotal for advancing higher education quality and cultivating new-quality talent. The 20th National Congress emphasized educational digitalization, guiding the systemic transformation of university foreign language teaching. Educational digitalization's essence lies in practical reform centered on teachers, students, and classroom ecological reconstruction, with their synergistic practices determining reform effectiveness. Based on systems, interaction, and equilibrium theories, educational ecology addresses foreign language teaching dilemmas. Jilin Province's policies support digital-education integration. This study, from an educational ecology perspective, explores AI-empowered foreign language teaching optimization, aiming to construct a pluralistic practice framework and provide theoretical-practical support for high-quality digital foreign language education.

2. Literature review and theoretical framework

Educational digitalization has become a core strategic imperative for the high-quality development of China's higher education. The General Secretary emphasized promoting the deep integration of AI and education to drive educational transformation, as AI empowerment is an inevitable trend for educational digitalization. Scholars have explored digital foreign language teaching from diverse perspectives: Wen [1] proposed an integrated ideological and political education system; Huang outlined foreign language curriculum components [2], others focused on instructional design [3] and teaching content [4]. Against the rise of educational ecology, related studies [5] highlight the multi-dimensional educational ecological environment and its role in language use and value cultivation. However, research on AI-empowered foreign language teaching models from an educational ecology perspective remains insufficient, requiring further exploration of classroom ecosystem optimization.

Derived from the "practice turn" in Western social theory and Nick Couldry's practice theory (based on Heidegger, Giddens, and Bourdieu), Pluralistic Practice refers to diverse interactive behaviors of different subjects in the educational ecosystem, aiming to optimize the educational system through multi-subject collaboration. It includes two core aspects: the coexistence and interaction of teacher-student practices (focusing on teaching and learning respectively) and the diversity of behaviors within each subject. Its ultimate goal is to promote coordinated teacher-student development and improve digital teaching quality.

3. Empirical investigation

3.1. Research design

This study adopted a mixed-methods design to examine the current status, problems, and intervention effects of teachers' and students' pluralistic practices in digital intelligent college English teaching. Participants were 82 non-English major undergraduates (40 in the experimental class, 42 in the control class) from Changchun University of Science and Technology (enrolled in 2025). Statistical tests confirmed no significant differences in college entrance English scores or basic AI literacy between the two groups ($P > 0.05$), ensuring comparability. Three core research questions guided the study: (1) What is the current status and existing problems of pluralistic practices in university digital foreign language teaching? (2) Can the education ecology-based Five-step Ecological Teaching Path improve these practices? (3) What impacts does this approach have on students' academic performance, motivation, and critical thinking? Research instruments included: a 100-point final academic test; a self-developed 5-point Likert scale questionnaire (Cronbach's $\alpha = 0.892$) covering seven dimensions; a classroom observation form; AI usage logs; and an open-ended feedback questionnaire. Multi-dimensional data collection ensured a comprehensive and objective evaluation of the pluralistic practice model.

3.2. Research methods

3.2.1. Research procedure

This study lasted for one semester (16 weeks in total) and was divided into three phases:

Phase 1: Pre-test and Baseline Survey (Weeks 1–2)

Pre-tests were administered to both the experimental class and the control class, including academic proficiency tests, self-assessment questionnaires, and baseline surveys of AI usage behavior. In-depth interviews were conducted with teachers to understand the current status and dilemmas of their digital

teaching practices. Classroom observations were also carried out to document the initial state of the classroom ecology.

Phase 2: Teaching Intervention (Weeks 3–14)

The experimental class adopted a pluralistic practice teaching model centered on the Five-step Ecological Teaching Path:

Module 1 (Weeks 3–4): Introduction to AI tools and initiation of pluralistic practice

Module 2 (Weeks 5–12): Project-based pluralistic practice, themed "Promoting Local Intangible Cultural Heritage in English"

Module 3 (Weeks 13–14): Reflection and presentation

The control class received traditional instruction, using identical teaching materials but without systematic pluralistic practice design.

Phase 3: Post-test and Effect Evaluation (Weeks 15–16)

Post-tests were conducted for both classes, including academic achievement tests, self-assessment questionnaires, collection of AI usage log data, gathering of students' open-ended feedback, and comparative classroom observations.

3.2.2. Intervention plan: The Five-step Ecological Teaching Path

The specific components of the Five-step Ecological Teaching Path implemented in the experimental class are shown in **Table 1**.

Table 1. Specific components of the Five-step Ecological Teaching Path

Step	Title	Teacher actions	Student actions	Role of AI tools
1	Teaching Inquiry	Raise challenging questions to stimulate cognitive conflict	Think independently and record initial ideas	None or quick information retrieval
2	Situation Construction	Present "standard answers" generated by AI as comparative materials	Compare their own responses with AI-generated answers	Generate exemplary content
3	Interactive Explanation	Organize group discussions and provide on-site guidance	Engage in group discussion and verify viewpoints with AI	Support instant information retrieval
4	Collaborative Inquiry	Assign group tasks and provide instructional scaffolding	Collaborate to complete tasks and appropriately employ AI	Assist content generation and optimization
5	Experiential Reflection	Organize presentations, evaluations, and summary improvement	Present outcomes and write reflective journals	Record learning process data

4. Results and analysis

4.1. Comparative analysis of academic achievement

Following a semester-long teaching experiment, a comparison of the final academic achievement scores between the experimental class and the control class is presented in **Table 2**. As shown in the table, the experimental class achieved an average score of 86.5, compared with 78.8 in the control class, representing a difference of 7.7 points. In terms of the excellent rate (score ≥ 90), the experimental class reached 35.0%, whereas the control class stood at only 11.9%, a difference of 23.1 percentage points. For the pass rate, the experimental class recorded 97.5% against 85.7% in the control class, a difference of 11.8 percentage points.

An independent-samples *t*-test revealed a statistically significant difference in the mean scores between the two classes ($t = 4.92$, $P < 0.05$). These results demonstrate that the pluralistic practice intervention

based on the Five-step Ecological Teaching Path yields a significant positive effect on improving students' academic achievement.

Table 2. Comparison of academic achievement between experimental and control classes

Class	Number of students	Mean score	Maximum score	Minimum score	Standard deviation	Pass rate	Excellent rate (≥ 90)
Experimental class	40	86.5	98	68	7.0	97.5%	35.0%
Control class	42	78.8	91	60	8.3	85.7%	11.9%
Difference	—	+7.7	+7	+8	−1.3	+11.8%	+23.1%

4.2. Comparative analysis of self-assessment questionnaire results

From the perspective of educational ecology, this study explores the pluralistic practices of teachers and students in digital foreign language teaching through questionnaires and experiments. Key findings (**Table 3**) show that the experimental class significantly outperforms the control class in academic performance, with a 7.7-point mean difference in scores and a 47.5% increase in manual proofreading of AI outputs. The experimental class also demonstrates enhanced pluralistic competencies, with 62.5% of students applying AI tools across other courses, and obvious improvements in classroom ecological balance. The essence of pluralistic practice lies in cultivating students' critical AI literacy, enabling them to shift from passive acceptance to active reflection. Teachers need to transform from technology users to ecological designers, integrating AI into instructional design. The study's theoretical and practical contributions lie in constructing a project-based curriculum system, providing support for educational digitalization reform. Future research will further expand the scope of investigation and improve the evaluation system to promote the ecological evolution of foreign language teaching.

Table 3. Comparison of self-rating questionnaire results and classroom behaviors between experimental and control classes

Evaluation dimensions	Experimental class	Control class	Difference
Learning interest	4.38	3.60	+0.78
AI technology acceptance	4.55	3.76	+0.79
Intercultural communicative competence	4.20	3.42	+0.78
Autonomous learning ability	4.25	3.55	+0.70
Critical thinking ability	4.00	3.28	+0.72
Teamwork competence	4.33	3.72	+0.61
Overall satisfaction	4.48	3.50	+0.98
Classroom behavior observation (per class session)			
Frequency of student-initiated questions	12.8	3.6	+9.2
Duration of teacher–student interaction (minutes)	19.0	9.0	+10.0
Frequency of peer collaborative discussions	4.4	1.7	+2.7
Frequency of student presentations	3.7	1.1	+2.6
Classroom attentiveness rate	92.0%	78.0%	+14.0%

4.3. Analysis of students' open-ended feedback

Upon completion of the experiment, open-ended feedback questionnaires were distributed to students in the experimental class to capture their subjective experiences and authentic perceptions of the pluralistic practice teaching model. Keyword extraction and frequency analysis were conducted, with results summarized in **Table 4**.

The feedback reflected strong student approval of the instructional model. The high-frequency keywords useful/helpful appeared 32 times, indicating widespread recognition of the practical value of AI tools. Interesting/fun occurred 26 times, confirming the positive effect of pluralistic practice in stimulating learning interest. Keywords such as active learning, critical thinking, teamwork, and enhanced confidence also appeared frequently, further verifying the effectiveness of the intervention in fostering autonomous learning, critical thinking, collaboration, and academic self-efficacy.

Excerpts of original student responses vividly illustrate the shift from passive reception to active knowledge construction.

Table 4. Keywords and typical excerpts from students' open-ended feedback

Keywords	Frequency	Typical excerpts
Useful / Helpful	32	"AI helps me find grammatical errors quickly and saves a lot of time."
Interesting / Fun	26	"Generating different versions of introductions with AI and comparing them is really interesting."
Active learning	22	"I now take the initiative to use AI to search for materials and practice speaking without being reminded by teachers."
Critical thinking	19	"What AI writes is not always correct; some cultural expressions require my own judgment."
Teamwork	18	"I learned a lot when working with group members on AI projects."
Enhanced confidence	16	"I used to dare not speak English, but now I can speak confidently with AI."

4.4. Analysis of in-depth teacher interviews

After the experiment, in-depth interviews were conducted with the experimental class instructor to explore their role perception, classroom experience, and implementation challenges, revealing three core themes. First, the teacher shifted from a knowledge transmitter to a learning designer and facilitator, consistent with the educational ecology positioning of teachers as ecosystem designers. Second, the teacher observed improved student engagement and a more dynamic classroom atmosphere, aligning with quantitative findings that pluralistic practice optimized classroom interaction. Third, key implementation challenges included increased lesson preparation workload and AI-related pressure for untrained teachers, suggesting the need for targeted instructional and technical support.

5. Conclusion

From the perspective of educational ecology, this study explores teachers' and students' pluralistic practices in digital college foreign language teaching through questionnaires and teaching experiments. Key findings indicate that the experimental class significantly outperformed the control class in academic performance (7.7-point mean difference, $P < 0.05$), with enhanced pluralistic competencies across seven dimensions, improved classroom ecology (shifting from teacher-centered to ecology-centered), strengthened critical AI awareness (manual proofreading rate from 25.0% to 72.5%), and a pronounced learning transfer effect (62.5% of students applied AI to other courses). These outcomes confirm that the Five-step Ecological Teaching Path

effectively addresses ecological imbalances in current digital foreign language teaching, such as teachers' technological anxiety and students' over-reliance on AI.

The essence of pluralistic practice is cultivating students' critical AI literacy, enabling them to shift from passively accepting AI outputs to active reflection. Teachers' transformation from technology users to ecosystem designers is pivotal to its implementation. The study's theoretical contribution is introducing educational ecology to digital foreign language teaching, proposing "pluralistic practice" and constructing the operable Five-step Ecological Teaching Path, while practically providing instructional, curriculum, and institutional support for stakeholders. Future research will expand the scope, deepen AI tool exploration, and improve evaluation tools. Ultimately, digital foreign language teaching is the educational system's ecological evolution, driven by teachers' and students' pluralistic practices.

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Disclosure statement

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