

Research on the Path of Artificial Intelligence Empowering the Development of Digital Literacy of College English Teachers

Yingjie Feng*

Xuchang University, Xuchang, 461000, China

*Corresponding author: 12007074@xcu.edu.cn

Abstract: Developing digital literacy by college English teachers faces challenges from the advent of artificial intelligence technology in education. In this study, we investigate the pathways of how artificial intelligence empowers the development of teachers' digital literacy, which builds up an analytical framework based upon three aspects: connotation definition; mechanism of action; and supporting strategies. By reviewing the concept evolution of digital literacy combined with the features of the college English teaching context, we identify the core elements of teachers' digital literacy within the intelligent technology environment. A literacy model composed of three dimensions (perception, acquisition, and transformation) has been built up according to the dynamic capability view. Pathway of literacy generation via cognitive apprenticeship effects, activation of teaching agency, and human-machine collaborative interaction were revealed at the mechanism level. Constructing an intelligent research and training ecosystem, applying the technology acceptance model, and direction of role reconstruction have been explored at the support level. We believe that the key to empowerment lies in activating the subjectivity of teachers via mechanism design so as to reach dynamic integration between technological application and humanistic value.

Keywords: Artificial Intelligence Empowerment, College English Teachers, Digital Literacy, Human-Machine Collaboration, Dynamic Capabilities

Introduction

Cultivation both of language competence as well as cross-cultural literacy are two-fold functions of College English teaching whose effectiveness relies greatly upon the perception and response by teachers towards the changing teaching environment. The technological breakthroughs in artificial intelligence in fields like natural language processing, learning analytics, intelligent assessment change the way we present, interact, evaluate knowledge in teaching which increases the demand on teachers' digital literacy. Most of the research focuses just on transplanting generic literacy framework or phenomenological description of single technology application without an in-depth analysis of the internal mechanism of intelligent empowerment, missing establishment of systematic pathways from the perspective of teacher agency. Lagging behind in theory exploration leads us to lack a reference point for the practice of teacher development. We need to base on the clarification of the unique connotation of college English teachers' digital literacy in the intelligent era, delve into the mode of action and transmission mechanism of artificial intelligence empowerment providing strong theoretical foundation support approaches for literacy development.

1. The Connotation Extension and Dimensional Reconstruction of College English Teachers' Digital Literacy in the Age of Artificial Intelligence

1.1 The Conceptual Evolution of Digital Literacy and Its Adaptation to the Teaching Context

The definition of digital literacy has changed dramatically over time—from technical operation skills to a comprehensive cognitive ability. The initial definition emphasized how to operate computer and retrieve information; what we were concerned about then is bridging the digital divide. With the deep penetration of information technology into the field of education, the connotation of digital literacy has gradually broadened to include several aspects such as information evaluation, content

creation, communication and collaboration, security and ethics. And with the rapid rise of artificial intelligence technology, the scope of digital literacy has been widened again. Digital literacy does not mean being proficient at using existing digital tools anymore, it also involves an understanding of algorithmic logic, grasp of data-driven decision-making and adaptive regulation capability in human-machine collaborative environment.

Generic digital literacy framework should be integrated within the context of college English teaching. Being characterized with instrumentality and humanistic quality, having lots of language input and output activities like cross-cultural communication simulation or individualized learning tutoring, the digital literacy of college English teachers can't just follow the generic framework, but need to integrate the specific demands of language teaching based on general digital competence. It shows up in: The ability of choosing and using corpus resources by college English teachers; Critical utilization of intelligent writing assessment tools; Competence in guiding and intervening when organizing language communication activities through digital platforms. Specificity of the teaching context requires a transition of the connotation of digital literacy from abstraction towards concreteness, from universality toward school-based and disciplinary integration^[1].

1.2 Identification of Core Elements of Literacy under the Embedding of Intelligent Technology

The integration of artificial intelligence technology into the college English teaching environment – be it intelligent speech assessment or automatic essay grading, be it adaptive learning recommendation or conversational language practice – changes the traditional way of teaching and learning with different kinds of intelligent system. We need to re-identify and redefine the core parts of college English teachers' digital literacy within this technological environment. The proficiency at the technical operation level has been replaced by teachers' judgment and decision making abilities in complex intelligent teaching situation. Teachers should properly understand the design logic and scope of application of each kind of intelligent tools and prudently choose appropriate technological means based on their teaching objectives instead of blindly following the trend of technologies.

As regards teaching functions, there are a number of related core aspects of digital literacy which is embedded within intelligent technology: Firstly, data literacy means teachers can collect, interpret, and use the multidimensional data produced by learners on intelligent platforms to diagnose their learning needs and adjust their teaching strategies; Secondly, human-machine collaboration literacy means teachers have the ability to define the division of labor between themselves and artificial intelligence systems when they teach with full play of technological advantages but uphold the humanistic warmth and value-guiding function of education; Thirdly, reflective practice competence in intelligent environment requires teachers constantly checking the actual effect of technological application, alertness to possible algorithmic bias or data misinterpretation and correcting it via teaching intervention. Three such elements woven together form the competence markers differentiating college English teachers in the intelligent era from those in the traditional period.

1.3 Construction of a Literacy Dimension Model from the Perspective of the Dynamic Capability View

Introducing dynamic capability view in studying college English teachers' digital literacy is no longer only static description of its composition. The dynamic capability theory emphasizes that there are processual characteristics of subject identification of opportunity, integration of resource, reshaping their own capability structure under environmental change. Digital literacy is far beyond a list of competencies, becoming a meta-competence system allowing teachers to realize self-renewal through constant interaction with the technological environment. It does not lie on remembering or master any specific skills, giving teachers an underlying mechanism for continuous learning and flexibility adaptation so as to calmly cope with the rapid iteration of artificial intelligence technology^[2].

Based on the logical framework of the dynamic capability view, we could build up the three dimensions of college English teachers' digital literacy as follows, Perception Dimension—teachers' perception of potential values and risks in the intelligent teaching environment; keen judgment about the suitability for instruction of new tools with a clear understanding of technological limitations and ethical risks; Acquisition Dimension—a proactive integration of technological resources and teaching strategies based on specific instructional objectives, combining the use of intelligent tools, flexibly adjusting teaching plans, integrating cross-platform resources; Transformation Dimension—an effective executive power of the teacher who transforms technological empowerment into tangible

improvement of students' language competence whose core is whether they can constantly reflect upon and iteratively update their own teaching practice so that technological application will always serve the essence of language teaching. The three dimensions are gradually connected together to describe the internal logic how literacy dynamically emerges and deepens inside the intelligent educational ecosystem.

2. The Internal Mechanisms and Impact Pathways of Artificial Intelligence Empowering the Development of Teachers' Digital Literacy

2.1 Analysis of the Logic of Technological Empowerment under the Cognitive Apprenticeship Effect

Cognitive apprenticeship theory highlights the knowledge acquisition process within an authentic environment through observations on expert demonstrations and progressively participating in practices under guidance, from peripheral participation to core competence. The cognitive apprenticeship theory has given us a unique perspective to understand how artificial intelligence empowers college English teachers' digital literacy. Artificial intelligence by design is inherent functional; cognitive demonstration as its operations processes exposes the decision-making logic and operational pathways which used to hide in experts' minds. Observing the feedback mechanisms of intelligent systems and analyzing their recommendation strategies enables college English teachers to observe a cognitive model that they can repeatedly access unlike one-time demonstrations in traditional training, giving them the technical convenience of accessing it at will for in-depth analysis.

As regards the specific operation of the empowerment logic: Artificial Intelligence offers two types of assistance for college English teachers – cognitive scaffolding and contextualized practice. For the former we have shown how the intelligent system breaks down the complex task of instruction design into operable steps sequence which allows teachers to gradually master the essentials of utilizing digital tools in vocabulary teaching, reading training or writing feedback under this structured guidance; as for the latter, it is exemplified by constant interaction between teachers and the intelligent system in actual teaching scenario wherein every response from the system acts like an immediate feedback on their operational behaviors much faster than human guidance covering all aspects of teaching in density so that they could complete the "try-observe-adjust" cycle within a relatively short time thus speeding up the internalization process of digital literacy.

2.2 Analysis of the Transmission Mechanism of Teaching Agency Activation

The empowerment of digital literacy for college English teachers with artificial intelligence is not only an issue of indoctrination but it's important that it empowers teachers' own teaching agency. The transformation of technological empowerment into literacy improvement should inspire teachers to reconsider their roles and professional development. With artificial intelligence taking over some repetitive and procedural teaching tasks, there will be cognitive space freed up by teachers which shifts their focus away from the technical operation level towards the level of instructional strategy design: From being passive users of tools to active thinkers about why they work and how we can use them better^[3].

Transmission chain of activation of teaching agency is very simple: Intelligent system reports some teaching phenomena that are normally hard to discover through working (e.g., learners' weak points in vocabulary acquisition; discourse distribution characteristics of classroom interaction; common types of grammatical errors in writing) – presentation of data is intuitive and powerful, usually provoke teacher's professional alertness and inquiry interest, so they actively search for deeper intelligent analysis functions or try other teaching intervention plans according to the problems shown by the data – such active explorative behavior will increase the frequency and depth of interaction between teachers and intelligent systems. As the exploration deepens, teachers' sense of control over technology gradually strengthens, their confidence in using technology to improve teaching increases too, thus forming a virtuous cycle. Activation of agency is gradually realized via this transmission mechanism of "data triggers attention - attention drives exploration - exploration enhances control".

2.3 Delineation of Literacy Generation Pathways in Human-Machine Collaborative Interaction

Human-machine collaboration is the primary battlefield for the generation of college English teachers' digital literacy in the age of artificial intelligence. Literacy comes from outside but a kind of

practical wisdom that was gradually generated through continuously interaction between teachers and intelligent systems; It has high contextual embeddedness and dynamic evolution: Different teachers will have different literacy structures according to their own teaching experiences, cognitive styles and value orientations when interacting with the same intelligent system. The ability to keep a subject position in human-machine collaboration (treats artificial intelligence as an auxiliary tool instead of a substitute)^[4], determines the quality of its generation.

We illustrate spiral progress evolution in literacy generation through human-machine collaboration on pathways; Teachers possess a shallow understanding about intelligent systems and call upon just basic functions while using it (literacy here reflects technical operation), but gradually notice some associations among system feedbacks and teaching outcomes which leads to change their usage behaviors from random attempts to strategic choice (the literacy structure involves data interpretation and judgment-based decision making); furthermore, after long-term use, teachers reach a relatively stable collaborative rapport with intelligent systems enabling flexible balancing of the division of labor between humans and machines according to different teaching objectives or learner characteristics (literacy here reaches dynamic balancing between technological boundaries and teaching needs). Literacy generation does not follow a line - there are plateaus and fluctuations during its development process, each step forward relies on teachers' reflection on past experience and actively adapting to new context.

3. Structural Support and Promotion Strategies for Artificial Intelligence Empowering the Development of College English Teachers' Digital Literacy

3.1 Construction and Operation of an Intelligent Research and Training Ecosystem

Building an intelligent research and training ecosystem aims at building a structural support environment supporting the continuous development of college English teachers' digital literacy. Its most important characteristic lies on the deep integration of artificial intelligence technology in every stage in teacher's research and training process turning it from a supplement to the essential architecture of the ecosystem. Contrasted with traditional research and training model, the intelligent research and training ecosystem breaks out the constraint of space and time, and resources barrier providing multidimensional learning support to teachers. The key foundation upon which the ecosystem works is data integration; collect teachers' instructional behavior data, learning preference data, and professional development trajectory, integrate them under one platform provide a basis for recommending personalized research and training pathway.

For an intelligent research and training ecosystem to work well, there are synergies among its three major parts - research and training content, interaction mechanism, and technical support. Updating research and training resources must be dynamic including the latest application achievements of artificial intelligence in the field of language teaching; designing interactions on this platform enables teachers to share experiences and collaborate for inquiries since social learning can help ease the feeling of isolation with other teachers while they adapt technology; communication between the technical team and the teaching team should always remain open, where iteration of platform functions relies upon reflecting real needs from teachers' feedback during their usage. Reasonable presentation of progress will increase teachers' willingness to participate further which creates a positive correlation between research/training activities and capability enhancement^[5].

3.2 Identification and Resolution of Empowerment Obstacles Based on the Technology Acceptance Model

Technology Acceptance Model unveils the obstacles faced by college English teachers in cultivating their digital literacy via the process of artificial intelligence empowerment. Perceived usefulness and perceived ease of use are two critical factors affecting individual's acceptance towards new technology. Some teachers doubt whether intelligent tools can really improve teaching effectiveness (e.g., writing evaluation or oral training) because they think the depth of feedback from the system cannot replace professional judgment for perceived usefulness; whereas perceived ease of use is about the user friendliness of the interface, intuitiveness of accessing features, and technical stability which makes the friction cost of operational adaptation non-negligible given the non-computer science background of the teacher population.

To overcome barriers for empowerment start by tackling antecedents (perceived usefulness and

perceived ease of use). In order to improve perceived usefulness we need to offer teachers an opportunity to access high quality intelligent tools with proof of effectiveness on particular teaching scenarios which makes teachers realize the practicability of using intelligent systems to reduce repetitive workload, giving them real-time diagnosis of learning conditions. For improving perceived ease of use there will be joint efforts both from technology design level and teacher training level; developing tools designed according to the principle of simplicity and clarity along with training activities based on task-driven approach allows teachers to gradually learn to master operational essentials whilst performing specific teaching tasks. Acceptance of technology is a dynamic change, continuous technical support and peer assistance help teachers overcoming difficulties when they are adapting initially^[6].

3.3 Teacher Role Reconstruction and Development Orientation for the Intelligent Educational Ecosystem

The deep application of artificial intelligence in language teaching alters the old teaching relationship structure; role position change is one dimension for developing digital literacy. Being replaced by intelligent systems for knowledge transmission, skill training and academic assessment, teachers' core value shifts from knowledge authority to learning facilitator. Teachers need to rethink their teaching function positioning and spend more energy on what cannot be easily replaced with intelligent tools: provide emotional support, cultivate critical thinking, guide cross-cultural understanding, stimulate creative language use. Role reconstruction means shift attention on teachers' professional value. In a new educational ecosystem, teachers have to take up different identities like learning architect, learning process facilitator, in-depth interpreter of learning outcomes.

Role reconstruction evokes new competency orientation for developing college English teachers' digital literacy: Technological literacy calls us from using tools to systems thinking – the ability of holistic understanding of the intelligent teaching environment with interconnection between different technological modules and comprehensive impact on learning outcomes; cultivate data literacy deeper – master the methodology of data-based teaching decision-making. Higher level of development demand integrate humanistic literacy and technological literacy – keep a clear awareness of the essence of language education in technological applications, treat artificial intelligence as an assisting force expanding the boundary of teaching possibilities, always maintain a subject position in human-machine collaboration.

Conclusion

We have developed a pathway framework empowering the development of college English teachers' digital literacy based on its three dimensions (connotation extension, mechanism analysis, and support strategies). For connotation expansion: expanding the connotation of digital literacy not only focusing on technical operation but also including data interpretation, human-machine collaboration and reflective practice; building up a three-dimensional model with dynamic capability view is an analytical tool grasping the generative characteristics of literacy. We analyzed at the mechanism level that cognitive apprenticeship effect enables the speed-up of internalization process via demonstration and feedback. The activation of teaching agency acts as a key transmission link between transforming technological empowerment into literacy enhancement, while the spiraling progression of literacy under human-machine collaborative interaction shows the dynamic evolutionary features of competency generation. At the support level, providing teachers with contextualized developmental space within the intelligent research and training ecosystem. Identifying and resolving the obstacle of empowerment can smooth out channels of technology acceptance, and repositioning of teacher's role points the way forward for literacy development. Future studies might study the differential impact of different kinds of artificial intelligence tools upon each dimension of teachers' literacy, exploration of evaluation indicators and measurement instruments for the effectiveness of digital literacy development, testing the applicability and transferability of the empowerment pathways in more teaching contexts. As the evolution of artificial intelligence technology, the connotations and development pathways of college English teachers' digital literacy will be continuously enriched and updated worthy of continuous theoretical attention from the academic community.

References

- [1] Wang, Qiang, and Xiao Shuyuan. "The Dilemmas and Reform Pathways of Foreign Language Teacher Education in the Age of Artificial Intelligence." *Shandong Foreign Language Teaching*, vol. 46, no. 4, 2025, pp. 73-81.
- [2] Xu Yueting, and Gu Yue. "Foreign Language Teaching and Foreign Language Teacher Professional Development in the Age of Artificial Intelligence: Challenges, Identity Crisis, and Solutions." *Contemporary Foreign Language Studies*, no. 1, 2025, pp. 60-72.
- [3] Zhang Jingyuan, and Zhao Hongyan. "Innovative Pathways for College English Teaching in the Context of Digital Transformation." *Foreign Language Journal*, no. 2, 2024, pp. 84-91.
- [4] Li Chunxia, Yang Qin, and Yang Wei. "Theoretical Logic and Implementation Strategies for Enhancing College English Teachers' Digital Literacy." *University*, no. 19, 2024, pp. 129-132.
- [5] Yu Yinlei, and Rao Hui. "Role Crisis and Identity Reconstruction of College Foreign Language Teachers in the Intelligent Era." *Foreign Language Audio-Visual Teaching*, no. 3, 2023, pp. 79-85, 124.
- [6] Huang Jingwei. "Construction of an Information Literacy Framework for College Foreign Language Teachers and Pathways for Technology-Enhanced Foreign Language Learning." *Journal of Social Science of Harbin Normal University*, vol. 13, no. 4, 2022, pp. 184-188.