

Research on the Integrated Cultivation Path of Scientific Literacy in College English Teaching

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Abstract: Against the dual background of building a strong country in education and developing new liberal arts, College English, as a core general education course in universities, not only undertakes the task of cultivating language proficiency but also shoulders the mission of integrating scientific literacy and cultivating interdisciplinary talents. The integration of scientific literacy is a key approach to breaking disciplinary barriers in College English and enhancing the educational value of the course. Based on the current reality of College English teaching, this paper systematically analyzes the dilemmas in cultivating scientific literacy in terms of curriculum system, teaching resources, faculty competence, and evaluation mechanisms. On this basis, it proposes targeted integrated cultivation paths from four dimensions: curriculum reconstruction, resource development, teaching innovation, and evaluation optimization. The study aims to provide theoretical references and practical guidance for College English teaching reform and support the coordinated development of language proficiency and scientific literacy.

Keywords: College English; Scientific literacy; Integrated cultivation; Teaching reform; Path research

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1. Introduction

With the accelerated evolution of the new round of scientific and technological revolution and industrial transformation, the country has an increasingly urgent demand for interdisciplinary talents with cross-disciplinary literacy, international vision, and innovative capabilities. The “Outline of the Plan for Building a Strong Country in Education (2024–2035)” requires breaking disciplinary barriers, promoting the restructuring of knowledge systems and the construction of “four new” majors, and reshaping talent training models^[1]. As the most widely covered general education course in universities, College English serves as an important bridge linking language learning and the cultivation of cross-disciplinary literacy. As one of the core competencies of modern talents, scientific literacy covers scientific knowledge, scientific methods, and scientific attitudes. Its deep integration with College English teaching is not only an inevitable requirement of new liberal arts construction but also an important measure to improve college students’ comprehensive competitiveness. At present, College English teaching still overemphasizes language skills while neglecting

literacy cultivation, and the integrated cultivation of scientific literacy faces many obstacles. Therefore, systematically exploring its integrated cultivation path is of great theoretical and practical significance.

2. Dilemmas in cultivating scientific literacy in college English teaching

2.1. Deviated curriculum orientation and unclear integration guidance

At present, the curriculum objectives of College English in most universities remain at the traditional level of language skill training, focusing on improving students' listening, speaking, reading, writing, and translating abilities. There is a lack of clear positioning and planning for the cultivation of scientific literacy, and scientific literacy has not been integrated into the curriculum objective system. In traditional teaching concepts, College English is simply defined as a humanities course, focusing on the transmission of humanistic knowledge while ignoring the infiltration of scientific knowledge, scientific thinking, and scientific attitudes, leading to the disconnection between language teaching and scientific literacy cultivation^[2]. Meanwhile, curriculum objectives lack hierarchy and pertinence. Differentiated scientific literacy objectives are not designed according to the needs of students from different majors. Unified teaching objectives and contents are adopted for both science and engineering students and liberal arts students, which cannot meet the personalized needs of students' professional development and literacy improvement. Such deviation in objective orientation deprives scientific literacy cultivation of clear guidance, making it difficult to integrate into the whole teaching process. As a result, students cannot simultaneously improve scientific literacy in language learning and struggle to adapt to the requirements of interdisciplinary talents in the new era.

2.2. Single and rigid curriculum content and lack of integrated elements

The selection and arrangement of College English content directly affect the effect of integrated scientific literacy cultivation. Most College English textbooks used in universities focus on humanities and social science topics, mostly involving culture, literature, and daily life, while lacking materials related to natural sciences, engineering, and technological innovation. The integration of scientific elements is seriously insufficient. Even if a small number of science and technology contents are involved, they are mostly presented with simple vocabulary and sentence patterns, lacking in-depth exploration and systematic explanation of scientific knowledge, methods, and thinking, failing to guide students to deeply understand scientific connotations and develop scientific thinking^[3]. In addition, curriculum content is updated slowly and fails to integrate cutting-edge scientific and technological achievements and international research trends in a timely manner, disconnecting from the development of the times and students' needs.

2.3. Insufficient comprehensive competence of teachers and weak integrated teaching

The teaching staff is the core support for the integrated cultivation of scientific literacy in College English, and their comprehensive competence directly determines the quality of integrated teaching. Most College English teachers in universities have a language-major background and lack systematic scientific knowledge reserves. They have limited understanding of natural sciences, engineering, and other fields, making it difficult to accurately and deeply integrate content related to scientific literacy in teaching. Meanwhile, most teachers lack interdisciplinary teaching concepts and abilities, are accustomed to the traditional "lecture-based" teaching mode, and are not good at designing teaching activities integrating scientific literacy. They cannot effectively guide students to think about scientific issues and cultivate scientific thinking in language learning^[4]. In

addition, the training for College English teachers mostly focuses on improving language teaching abilities, lacking special training on scientific literacy and interdisciplinary teaching methods, making it difficult for teachers to renew teaching concepts and improve integrated teaching abilities.

2.4. Single and backward evaluation mechanism and insufficient incentive effect

A scientific and reasonable evaluation mechanism is an important guarantee for promoting the integrated cultivation of scientific literacy. However, the current College English teaching evaluation mechanism is obviously single and backward, failing to play an incentive and guiding role in scientific literacy cultivation. The evaluation of College English teaching in universities is mostly summative, mainly through final examinations and CET-4/6 to assess students' mastery of language knowledge and skills, lacking effective evaluation indicators and methods for the improvement of students' scientific literacy. The evaluation content overemphasizes language scores and ignores students' performance in scientific thinking, scientific attitudes, and innovative abilities, leading to students' lack of motivation to improve scientific literacy^[5]. Meanwhile, the evaluation subject is single, mostly teacher evaluation, lacking student self-evaluation, peer evaluation, and practical evaluation, which cannot comprehensively and objectively reflect the effect of students' scientific literacy cultivation.

3. Integrated cultivation paths of scientific literacy in college English teaching

3.1. Reconstruct the curriculum system and clarify integrated objectives

Reconstructing the curriculum system is the foundation for realizing the integrated cultivation of College English and scientific literacy. Based on the requirements of new liberal arts construction, it is necessary to break traditional curriculum boundaries and clarify the objectives and directions of integrated cultivation.

First, adjust curriculum objective positioning, incorporate scientific literacy cultivation into the overall objectives of College English, and build a dual-core objective system of "language proficiency + scientific literacy". Clarify the cultivation requirements of scientific knowledge, scientific methods, and scientific attitudes to achieve the coordinated development of language skills and scientific literacy^[6]. According to the needs of students from different majors, design differentiated curriculum objectives: for science and engineering students, focus on the cultivation of scientific literacy related to scientific English application and research literature reading; for liberal arts students, focus on the infiltration of scientific thinking and common sense to ensure the pertinence and hierarchy of objectives.

Second, optimize curriculum module settings, build a modular and diversified curriculum system, and add modules such as scientific English, academic English, and interdisciplinary English, integrating content related to scientific literacy into each module. The basic module focuses on the infiltration of scientific common sense and basic scientific vocabulary; the improvement module focuses on the cultivation of scientific literature reading and scientific English writing; the expansion module focuses on the discussion of cutting-edge scientific topics and interdisciplinary project practice, realizing the deep integration of curriculum content and scientific literacy^[7].

3.2. Develop integrated teaching resources and enrich content carriers

High-quality teaching resources are important support for the integrated cultivation of scientific literacy. Based on teaching needs, it is necessary to develop integrated teaching resources with both linguistic and scientific

characteristics to enrich the content carriers of integrated cultivation.

First, optimize textbook content, update textbook materials according to the development of the times and students' needs, increase content related to natural sciences, technological innovation, and scientific research achievements, dig out scientific elements in materials, and organically combine scientific knowledge, scientific methods, and language knowledge^[8]. For example, select cutting-edge scientific reports and excerpts from research papers in reading materials to guide students to understand scientific knowledge and master scientific methods while learning languages; design writing tasks such as scientific expositions and abstracts of research reports in writing teaching to improve students' ability to express scientific viewpoints in English.

Second, build a diversified teaching resource platform and integrate online and offline resources to enrich resource forms. Online, a scientific English resource library can be built, collecting scientific literature, popular science videos, cutting-edge science lectures, etc., for students' independent learning; offline, cooperate with science and engineering departments to collect English learning materials related to majors and develop school-based textbooks and case sets^[9]. Meanwhile, encourage teachers to develop personalized teaching resources according to teaching practice, such as scientific topic courseware and popular science English short videos, to enhance the pertinence and interest of teaching resources. In addition, strengthen school-enterprise cooperation, introduce real enterprise scientific English application cases, let students feel the combination of scientific literacy and language ability in real scenarios, and improve application ability.

3.3. Innovate teaching methods and strengthen integrated practical experience

Innovating teaching methods is the key to improving the effect of integrated scientific literacy cultivation. It is necessary to break through the traditional lecture-based teaching mode, adopt diversified teaching methods, strengthen students' practical experience, and realize the organic combination of language learning and scientific literacy cultivation.

First, implement project-based teaching and design interdisciplinary teaching projects, allowing students to conduct inquiry learning around scientific topics in teams^[10]. For example, assign project tasks such as "the impact of technological development on society" and "environmental protection technology innovation", guide students to complete the process of consulting English literature, collecting scientific materials, conducting group discussions, writing English reports, and giving English presentations. In the process of completing the project, students improve their language ability, scientific thinking, and innovation ability^[11].

Second, adopt the case teaching method, select typical scientific and research cases, guide students to analyze and discuss the cases, dig out scientific knowledge and methods in the cases, and cultivate students' critical thinking and problem-solving ability. In case teaching, teachers can guide students to analyze cases and express viewpoints in English to realize the simultaneous improvement of language application and scientific literacy.

In addition, use modern educational technology to innovate teaching modes, adopt blended teaching, combine online independent learning and offline classroom teaching, build virtual simulation teaching scenarios, let students experience scientific practice in virtual environments, and improve scientific literacy and language application ability. Meanwhile, encourage students to participate in English popular science activities and scientific research innovation activities, such as popular science English speeches and scientific English competitions, to strengthen practical experience and consolidate the effect of integrated cultivation.

3.4. Optimize the evaluation mechanism and strengthen integrated incentive

Optimizing the evaluation mechanism is an important guarantee for promoting the normalization of integrated scientific literacy cultivation. It is necessary to break the single summative evaluation mode, build a diversified and process-based evaluation system, and strengthen the incentive and guiding role of evaluation.

First, improve the evaluation content, include scientific literacy in the evaluation scope, and build a comprehensive evaluation index system of “language proficiency + scientific literacy”, covering language knowledge, language skills, scientific knowledge, scientific thinking, scientific attitudes, innovation ability and other evaluation contents to ensure the comprehensiveness of evaluation^[12]. For different evaluation contents, formulate specific evaluation criteria: scientific thinking can be evaluated from critical thinking, problem analysis, and innovative expression; scientific attitudes can be evaluated from inquiry spirit, rigor, and cooperation awareness.

Second, innovate evaluation methods, implement the evaluation mode combining process evaluation and summative evaluation, strengthen the evaluation of students’ learning process, and comprehensively track the improvement of students’ scientific literacy and language ability through classroom performance, group discussions, project reports, independent learning records and other forms^[13]. Meanwhile, enrich evaluation subjects, introduce student self-evaluation, peer evaluation, teacher evaluation, enterprise evaluation and other multiple subjects to ensure the objectivity and fairness of evaluation results.

In addition, strengthen the application of evaluation results, link evaluation results with students’ merit evaluation, scholarship assessment, employment recommendation, and connect with teachers’ assessment, professional title evaluation, teaching excellence evaluation, fully mobilize the enthusiasm and initiative of teachers and students to participate in the integrated cultivation of scientific literacy, and promote the sustainable development of integrated cultivation.

3.5. Strengthen school-enterprise and inter-university cooperation and expand integrated practice channels

School-enterprise and inter-university cooperation is an important support for expanding the integrated cultivation path of College English and scientific literacy. It can realize resource complementarity and advantage sharing, provide real practice scenarios for students, and improve the effectiveness of integrated cultivation.

Universities should take the initiative to strengthen cooperation with scientific research enterprises and high-tech enterprises, establish practical teaching bases, and build a linkage platform of “language learning + scientific practice”. Let students go deep into enterprises to participate in scientific research and development, technical exchanges and other related work, and improve their scientific English application ability and scientific literacy in practice^[14]. Meanwhile, invite enterprise researchers and technical backbones to enter the classroom, carry out special lectures, case sharing and other activities, explain the application skills of scientific English and basic methods of scientific research combined with actual enterprise needs, and make up for the disconnection between classroom teaching and practical application.

In addition, strengthen inter-university cooperation, especially with science and engineering universities, carry out cross-school course selection, joint teaching, scientific research project cooperation, and other activities, integrate teaching resources and teaching staff of both sides, and realize the complementary advantages of liberal arts and science and engineering. Let students broaden their horizons in cross-school exchanges, improve interdisciplinary thinking and scientific literacy, and promote the deeper development of

the integrated cultivation of College English and scientific literacy^[15].

4. Conclusion

The integrated cultivation of scientific literacy in College English teaching is an important measure to adapt to the needs of new liberal arts construction and interdisciplinary talent training, and also an inevitable direction of College English teaching reform. At present, the cultivation of scientific literacy in College English teaching faces dilemmas such as deviated curriculum objectives, single content, insufficient teachers, and backward evaluation, which seriously restrict the effect of integrated cultivation. Through reconstructing the curriculum system, developing integrated teaching resources, innovating teaching methods, optimizing the evaluation mechanism and other paths, we can effectively break disciplinary barriers and realize the coordinated improvement of language proficiency and scientific literacy. This will make College English a truly important carrier for cultivating interdisciplinary talents and improving students' comprehensive competitiveness, providing strong support for the construction of a strong country in education.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Hao H, 2026, Exploration on the “Knowledge Graph +” Teaching Practice Strategy of College English Courses in the New Media Era. *Journal of News Research*, 17(2): 144–148.
- [2] Zhang J, 2025, Research on the Effectiveness of Hierarchical Teaching Mode of College English in Applied Undergraduate Colleges. *Journal of Hubei Open Vocational College*, 38(22): 36–38.
- [3] He L, 2025, Exploration on the Strategy of Developing College English Teachers' Literacy in the Smart Education Era. *Science & Culture Review*, (20): 41–44.
- [4] Tan J, 2025, Research on College English Teaching Reform Strategy Under the Background of High-Quality Development. *Journal of Jiamusi Vocational College*, 41(10): 215–217.
- [5] Zhang Y, 2025, The Shift and Strategy of Ideological and Political Practice in College English Courses Under the Blended Teaching Mode. *Journal of Changsha Aeronautical Vocational and Technical College*, 25(2): 70–74 + 96.
- [6] Li B, Qu B, 2025, Feasibility Research on Cultivating Students' Scientific Literacy in College English Teaching. *Campus English*, (3): 27–29.
- [7] Cai J, 2024, English Curriculum Standards for Compulsory Education (2022 Edition): Cultivating Scientific Literacy. *Journal of Beijing International Studies University*, 46(1): 19–28.
- [8] Cai J, 2023, The Basis for Formulating the Syllabus of School-Based College English Teaching in Chinese Universities—Also on the Orientation of General English and ESP in College English Teaching. *Foreign Languages Research*, 40(5): 58–62 + 112.
- [9] Peng S, 2023, The Integrated Path of Ideological and Political Education in “New Horizon College English” Based on Project-Based Teaching. *University*, (8): 30–33.
- [10] Dong N, 2023, Research on the Ecological Construction of Classroom Cultural Environment in College English from the Perspective of Ideological and Political Education. *Campus English*, (10): 19–21.

- [11] Ren Y, 2022, A Study on the Humanistic and Scientific Nature of College English Curriculum. *Journal of Southwest University of Science and Technology (Philosophy and Social Sciences Edition)*, 39(5): 105–110.
- [12] Cai J, 2021, Cultivating Innovative Talents in Colleges and Universities from the Perspective of Scientific Literacy: A Study on Public English Curriculum Reform. *Journal of Beijing International Studies University*, 43(2): 3–14.
- [13] Yang X, 2020, Research on the Incentive Effect of College Students' Cognitive Advantages on the Cultivation of Humanistic and Scientific Literacy in Curriculum Teaching. Thesis, Xi'an Shiyou University.
- [14] Ma R, 2020, Construction of "Golden Course" of College English Based on the Goal of "International Talent Training with Professional Characteristics". *Jiangsu Foreign Language Teaching and Research*, (1): 5–7.
- [15] Xu J, Zhu Q, Tang X, et al., 2016, The Compilation Concept and Characteristics of New Target College English: Viewing, Listening and Speaking Course. *Foreign Language World*, (2): 16–22.

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