Construction of an Ideological and Political Teaching Model in Academic English Courses for Science and Engineering Majors Under the Guidance of Fostering Virtue Through Education

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Abstract: *Academic English courses for science and engineering have provided spaces for language skills training over the years but never systematically explored its value guidance. Based on Systemic Functional Linguistics and critical academic literacy theory, we claim that value guidance is an ontological function of academic English courses. A teaching model consisting of goal levels, content logic, and strategy configuration with a dynamic operating mechanism and a dual-track evaluation framework is constructed. The distinctive feature of this model lies in embedding value anchors in micro-level analysis of academic discourse such that value guidance can be integrated in language practice leading to coordinated development of academic literacy and value awareness without losing the main line of course teaching. This research provides a teaching framework serving as a reference for developing the value function of academic English courses for science and engineering.*

Keywords: *Fostering virtue through education orientation; Academic English for Science and Engineering; teaching model of curriculum-based ideological and political education; infusion-based integration; value literacy assessment*

Introduction

The primary mission of academic English courses is cultivating the academic communication competence among learners under the context of internationalization of higher education; they are taken by a great number of students majoring in science and engineering discipline. Current course designs emphasize only discourse structure analysis and writing format training while not fostering the value-bearing space including an awareness of academic norms and judgment of research ethics. Some scholars advocate paying attention to the cultivation of academic character from the conceptual level but lack systematic teaching models according to the disciplinary characteristics especially fine-grained schemes adapting to the constraint of Academic English for science and engineering—empirical discourse, structured texts, and instrumental motivation. Consequently, value guidance in the classroom becomes empty rhetoric disconnected with language teaching or shelved because lacking pathways. Focusing on the actual practice of Academic English teaching for science and engineering, we show the theoretical connection between value guidance and Academic English teaching, constructing a teaching model embedded into the routine components of language teaching which bridges the disconnect between conceptual advocacy and classroom operation.

1. The Internal Logic Between the Fostering-Virtue-Through-Education Orientation and Curriculum-Based Ideological and Political Education in Academic English for Science and Engineering

1.1 The Value Orientation of the Fostering-Virtue-Through-Education Concept in Academic English Education

1.1.1 Reflection on the Value Neutrality of Academic English Courses

The Academic English course is pure language skills training; the instrumentality hides the value-bearing space inside it. Actually, there are such problems like an awareness of academic norms, a

judgment of research ethics or an appreciation of the scientific spirit in the teaching materials of Academic English. They transmit non-neutral knowledge but implicit academic cultural stance and code of conduct. The learners learning to build academic discourse by this rule will unavoidably come into contact with the value norm of the disciplinary community. To treat Academic English as value-free language practice is contrary to the social semiotic nature of academic discourse and ignore the objective existence of identity and cultural adaptation in language education.

1.1.2 Dimensional Definition of the Value Orientation of Academic English for Science and Engineering

Value orientation of Academic English courses for science and engineering will arise naturally out of its inherent requirement of academic literacy instead of being tagged by external moral tags. This is an Awareness of academic integrity (learners' conscious observance of the norms of knowledge production and citation ethics), Sensitivity to scientific ethics (the ability to recognize issues like data authenticity, experimental ethics that exist in research activities) and Academic responsibility (ability to articulate one's own research stance during international academic exchange; having some awareness about the consequence of discourse). These three aspects are all embedded into the core teaching components of Academic English which forms a symbiotic relationship with the development of language competence.

1.2 Theoretical Support and Pathway Analysis for Integrating Value Guidance into Academic English Courses

1.2.1 Theoretical Connection Between the Language System and Social Values

Systemic functional linguistics sees language as a social semiotic system that mutually constitutes lexicogrammatical choice in discourse and context and ideology: implicit value judgments and cultural presuppositions are encoded into different features (modal verb usage, citation strategy, argumentative structure) of Academic English discourse, providing linguistic justification for value discussion in the classroom. Critical academic literacy theory believes that learners' ability to reflect on the power structures and ethical presuppositions underpinning disciplinary discourse is also part of academic literacy. These two theories demonstrate that value guidance is not extra work outside language teaching but one of the ontological function of Academic English courses.

1.2.2 Pathway Orientation for Integrating Value Guidance into Academic English Teaching

There are currently two ways to integrate value guidance into Academic English; one is called "thematic integration" that explicitly discusses on values through setting up dedicated thematic units (e.g., scientific ethics or the social impact of technology), which has a systematic nature but cannot be easily linked with language skills training. The other is called "infusion-based integration". Value elements are infused into regular language activities like academic reading/writing/presentation, achieving implicit transmission via activities such as in-depth discourse analysis/analysis of writing ethics. Due to the time constraint of Academic English for science and engineering and the instrumental motivation of learners, the infusion-based pathway seems better suited because it doesn't change the main line of language teaching in the course, rather activate from within the space for generating value concerns[1].

1.3 Boundary Delimitation and Element Identification of the Teaching Model of Curriculum-Based Ideological and Political Education in Academic English for Science and Engineering

1.3.1 Teaching Constraints of Academic English Courses for Science and Engineering

Firstly, hiding value expression within the dominant features of empirical description and data presentation in discipline's discourse requires more detailed discourse analysis to extract value anchors is one constraint of Academic English courses in science and engineering; Secondly, the structure of reading and writing materials have very formulaic structural paradigmes, the fixed parts (abstract, method, etc) provides operable entry point in classroom setting, where value discussion can be embedded at some location are another constraints. Usually learners perceive it as a supporting tool for their major but they do not have any natural awareness about its value function so we need to arouse value concerns through our teaching process instead of relying on learners' presupposed expectations.

1.3.2 Composition and Relationships of the Core Elements of the Teaching Model

Under these constraints, we present the main parts in our teaching model like this: Goal element is

for direction and level of value guidance which should fit the pace of developing academic English competence; Content element means selecting and organizing value anchors inside academic discourse materials; The method element plays a role of transforming value issues into classroom activities (task design and cognitive guidance strategy); Evaluation element analyses goal attainment and gives regulatory feedbacks. Four elements arrange cyclicly: "goals guide content, content regulates methods, methods affect effects, and effects feed back to goals" – Goal element logically starts first followed by others sequentially and calibrate backwards.

2. Structural Dimensions of the Teaching Model of Curriculum-Based Ideological and Political Education in Academic English for Science and Engineering

2.1 Goal-Level System of Curriculum-Based Ideological and Political Education in Academic English Courses

2.1.1 Setting of Foundational-Level Goals: Awareness of Academic Norms and Information Discernment Ability

Aim of foundational level: Learners' cognition and observance of the basic codes of conduct of the academic community. The core writing skills such as literature citation, data presentation and paraphrase of viewpoints involve in Academic English courses. Teaching these skills not only trains the mechanics of format norms but can also make learners understand the academic integrity logic behind the norms. Information discernment ability refers to the capability of learners to judge the reliability and authority of sources given various academic information sources. This directly relates to examining literature sources, publication channels and peer review status in Academic English reading teaching. Achievement of foundational-level goals is reflected by learners' conscious observation of academic norms in academic writing and reading with a preliminary awareness for judging information quality[2].

2.1.2 Progression from Advanced-Level Goals to Integrative-Level Goals: Value Awareness and Value Expression

Advanced-level goals increase the norm awareness (cognitive level) into the value awareness ability (critical thinking level), when dealing with controversial academic topics, evaluating other's research design, and participating in academic discussion, it is necessary for them to be sensitive enough to detect research presuppositions, trends in data interpretation, and deviation in theoretical stances. Naturally exists within the component of critical reading and academic debate teaching of Academic English. Integrative-level goals refer to the value expression ability in academic expression referring to learners consciously applying appropriate rhetoric strategy to express their own academic stance while writing an academic paper or making academic presentation; present the image of a responsible researcher during international academic exchange. These three levels of goals develop sequentially from cognitive acquisition to critical thinking internalization followed by expressive output corresponding to the development of Academic English competence from input to output.

2.2 Content Organization Logic of Curriculum-Based Ideological and Political Education in Academic English Teaching for Science and Engineering

2.2.1 Extraction of Value Anchors and Discourse Configuration in the Academic Reading Module

The teaching of academic reading for science and engineering should structure its content by discourse selection: Selected academic texts not only present pure natural phenomena or explain technical principles, but also include appropriate discourse materials about ethical choices in research, consequences of technological application as well as evolution of scientific controversies. Extraction of value anchors in discourse teaching requires some language analysis operations – e.g., guiding students to notice how the author uses modal verbs when describing research results that indicate the degree of prudence in conclusion; expressing stance tendencies via citation strategies when comparing different research conclusions etc. Anchoring value discussion at linguistic level prevents empty which is disconnected with the text while maintaining the language orientation of reading teaching.

2.2.2 Embedding Ethical Issues in the Academic Writing and Communication Modules

Content organization of the academic writing module allows us to insert discussions on academic writing ethics during our normal teaching of writing – while teaching literature review writing, we explain the analysis of citation motivation and attribution of viewpoints; while teaching the research

design, we consider about data collection ethics and authenticity of result presentation; while teaching the discussion section, we let learners think about the boundary and limitation of their own inference of conclusions. Academic communication module is organized by information accuracy and responsible expression in academic presentations which allow learners to feel the social impact of academic discourse through simulation of international conferences. Taking academic English skills development as the main line, all three modules (reading, writing, and communication) each embed value issues into their respective skills teaching parts, creating a content configuration pattern with skills training and value guidance running in parallel without contradiction[3].

2.3 Process-Oriented Strategy Configuration of Curriculum-Based Ideological and Political Education in Academic English Teaching for Science and Engineering

2.3.1 Coordinated Application of the Problem-Driven Strategy and the Discourse Inquiry Strategy

The problem-driven strategy opens up classroom discussion with open-ended academic questions – an instructor can provide academic situations about judgments on research ethics or attributions of scientific responsibility for learners to make initial judgments based on incomplete information that elicits cognitive conflict; followed by discourse inquiry strategy which guides students back to the linguistic evidence of academic texts analyze (at micro-levels such as lexical choice, syntactic structure, and rhetorical devices), how different stances are constructed at the linguistic level. These two kinds of strategies create a teaching sequence of: activate attention via questions — provide evidence via discourse — clarify judgments via analysis where learners naturally experience the process of examining value issues in language analysis activities instead of passive acceptance of predetermined value conclusions.

2.3.2 Classroom Operating Mechanism of the Value Negotiation Strategy

Value negotiation strategy: There are convergences/collisions among several viewpoints during class interactions. During discussions/debates part of Academic English, learners express their stances according to the discourse evidence they have read about a certain academic ethical issue; meanwhile, teachers facilitate the control of the direction of the discussion to avoid falling into an either-or binary opposition. Value negotiation does not focus on arriving at a unified conclusion, it enables learners to realize how one academic issue can be explored from different perspectives, reflect upon the basis/limitations of our judgment through listening/responding to other's viewpoint. Teachers should have the ability to coordinate the classroom coordination of language interaction and value discussion while learners must have basic oral Academic English expression ability as a prerequisite to participate. These three kinds of strategies use language activities as its carrier, embed value guidance into the process of language practice.

3. Operating Mechanism and Efficacy Optimization of the Teaching Model of Curriculum-Based Ideological and Political Education in Academic English for Science and Engineering

3.1 Dynamic Operating Model of the Teaching Model of Curriculum-Based Ideological and Political Education in Academic English for Science and Engineering

3.1.1 Analysis of the Interactive Relationships Among Goals, Content, Strategies, and Feedback

Each component of this teaching model does not have static parallel relations; instead it is a dynamic network that generates teaching functions through continuous interaction among them. Goal provides directional constraints upon the selection of content, content provides the corpus support for realizing goals, strategy acts as channeling content into classroom activities, and feedback collects various information about the teaching process and reversely calibrate the previous three links. Together they form a closed-loop structure that operates in an open manner where any link may be changed/adjusted according to feedback signals within each teaching cycle. Clear definition of their interactive relationship serves as a foundation when we go ahead to construct its operating model.

3.1.2 Cyclical Pathway and Stage Characteristics of Teaching Operation

Based upon the interactive relationships between all four elements, the spiral cyclical path for teaching operation can be described as such: "goal setting — content configuration — strategy implementation—information collection—goal adjustment". A whole teaching unit undergoes about three stages during its process: In the initiation stage, we set goals and choose contents, which means

teachers decide what kind of value guidance should be focused according to learners' current level, matching appropriate academic discourse materials; in the implementation stage, we implement strategies, in which value elements in the content are gradually presented via classroom interactions; finally, in closing stage, we collect and analyze the learning output information, and then feed back to adjust the goal and content of the next cycle. The stages don't have clear boundaries separating them with each other but overlapping and permeating each other when actually being operated, though the direction remains constant along this cyclical pathway, therefore providing an inherent operating order for the teaching model[4].

3.2 Evaluation Dimensions of the Teaching Effectiveness of Curriculum-Based Ideological and Political Education in Academic English for Science and Engineering

3.2.1 Evaluation Indicators for the Academic English Language Competence Dimension

Main aspects of evaluation are language competence development using indicators according to traditional framework of the Academic English competence scale: discourse structure identification ability, core argument extraction ability, argumentation logic tracking ability in academic reading; mastery of register norms, appropriateness of literature citation, argumentative coherence in academic writing; clarity of oral expression, logicality in answering questions, accuracy in the use of academic register vocabulary in academic communication. The above-mentioned indicators take the standardized academic tasks completed by learners at different stages of the course as carriers for evaluation, showing the changes in competence through comparing pre-test and post-test or analyzing staged works, providing basic data for the language teaching effectiveness of the teaching model.

3.2.2 Qualitative Evaluation Framework for the Value Literacy Growth Dimension

The growth of value literacy includes changes at deep cognitive and attitudinal level which cannot be captured by standard tests but need to be captured through qualitative tools. The evaluation has three aspects of observation including sensitivity to academic ethics (analyze the content and way of learners' response to research ethics issues in discussion components); reflectiveness of stance (examine the explanation and trace of questioning about the basis of their own academic judgment from learners' reflective journals) and awareness of cross-cultural academic communication (observe how learners deal with different academic stances and cultural background differences in simulated international communication scenarios). Systematic collection of learning portfolio and reflective interview at the end of the semester offers a solid base to evaluate those dimensions, whose evaluation results were presented as feedback rather than quantitative scores[5].

3.3 Sustainable Optimization Pathways for the Teaching Model of Curriculum-Based Ideological and Political Education in Academic English for Science and Engineering

3.3.1 Dynamic Updating Mechanism for the Teaching Content Material Bank

The continuous operation of the teaching model depends on the continuously updated contents. The establishment of a system of updating to construct the academic discourse material bank regularly involves new emerging controversial issues in the field of science and technology ethics, academic texts having discussion value in interdisciplinary research or comparison between academic discourse norms under different cultural backgrounds. Maintenance of the material bank indicates the effect of using these materials in classrooms, replace those materials with weak effects in activating value discussions. It will ensure synchronicity of the teaching content with the frontier of the discipline avoiding the solidification of materials causing value issues lose their immediacy and cognitive stimulation in discussion.

3.3.2 Coordinated Improvement of Teachers' Professional Cognition and Strategy Implementation

The extent to which implementers comprehend these concepts and operational points largely determines the effectiveness of this model. The instructors need both professional skills in Academic English teaching as well as profound cognition regarding academic ethics issues: one is responsible for ensuring the quality of classroom language teaching activities while the other guarantees the appropriateness of the direction and measure of value guidance. Optimization pathways include organizing case discussions regularly between members of the teaching team sharing views on typical cases occurring during classroom operations and distilling strategies from them; establishing channels for interdisciplinary dialogue with relevant fields of research ethics to broaden their horizon of understanding about academic ethics issues in science and engineering. Adjustments of teaching

strategies continuously are made based upon classroom observation records and feedbacks on learners' learning experiences, so as to make differentiated adjustments to combination of strategies according to different teaching situations accordingly, thereby guaranteeing that the operation of the model always adapts to specific teaching situations.

Conclusion

Teaching model of curriculum-based ideological and political education in Academic English for Science and Engineering that was developed based on the fostering-virtue-through-education orientation established by this study uses language teaching as its main line but embeds value guidance into routine elements like academic reading, writing and communication, establishing a teaching framework which is theoretically grounded and operationally oriented. We start from Systemic Functional Linguistics and critical academic literacy theory on the theoretical level to demonstrate value guidance as an ontological function of Academic English courses, construct a three-level goal system on the model construction level, organize content through three modules as carriers, transform value issues in classrooms through three types of strategies, support the model with a dynamic operating model and a dual-track evaluation framework so that teaching will have followable pathways and testable bases. Our model provides an embedded rather than additive solution for curriculum-based ideological and political education, coordinating advancement between academic competence and value literacy without changing the language teaching nature. The applicability of our model in various teaching situations requires further testing, we can further investigate transfer and adaptation in digital learning environments or design teacher professional development pathways to ensure the efficacy of our model being supported more reliably.

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