



The Cultivation Paths of Terminological Awareness in Mechanical English from the Perspective of ESP

Chenghao Geng¹, Bingbing Leng^{2*}

College of Foreign Language, University of Shanghai for Science and Technology, Shanghai, China.

*Corresponding Author

Bingbing Leng

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Abstract: Terminology not only serves as a linguistic representation of professional concepts but also functions as an important medium through which learners access disciplinary knowledge systems. For lower-year undergraduate students majoring in science and technology translation, learning Mechanical English should go beyond memorizing bilingual equivalents of terms and focus more on the conceptual relations, formation patterns, and contextual use of terminology. Based on the characteristics of Mechanical English as an ESP course, this study examines the major features of mechanical terminology in terms of conceptual dependence, word formation, and contextual usage. It further explores approaches to cultivating terminological awareness through conceptual system construction, analysis of word formation and naming motivations, and problem-based inquiry. The study argues that integrating terminology learning into professional knowledge systems and authentic discourse contexts can facilitate students' transition from vocabulary memorization to conceptual understanding and domain-specific judgment, providing implications for the cultivation of terminological competence among undergraduate students majoring in science and technology translation.

Keywords: English for Specific Purposes; Mechanical English; terminological awareness; conceptual system; problem-based learning.

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1. Introduction

Terms are conventional linguistic signs used to express, delimit, and designate specialized concepts within a particular field. They serve not only as the basic linguistic units of specialized communication but also as carriers of domain-specific knowledge. Through conceptual relations such as superordination and subordination, whole and part, and process and result, terms form terminological systems that further reflect the corresponding systems of specialized knowledge. If specialized knowledge is conceptualized as a network, terms constitute the nodes within that network. Terms can therefore be regarded as the "crystallization of knowledge" or as "knowledge units" (Gong Y, 2009). To a

certain extent, an individual's command of the terminology of a particular field also reflects their understanding of the knowledge system within that field (Qian C et al., 2023). In this sense, terminology constitutes the metalanguage of science (Sun H, 2011). Concepts assigned conventional term designations are described through definitions, enabling terms to provide clear answers to the question of "what something is."

"Terminological awareness" is an important concept connecting terminological knowledge with terminological practice. It refers to a form of scholarly self-awareness that arises from an understanding of the nature and functions of terms and that requires individuals to treat terms in their



own fields rigorously and scientifically while approaching terms from other fields with due caution(Zheng S, 2014). This definition emphasizes that terminological awareness is an attitude towards specialized knowledge and specialized language. It also includes a willingness to proactively acquire knowledge of terminology, subject-matter knowledge, and methods of term translation. In other words, it involves both “scholarly self-awareness in the rigorous treatment of terms” and “the proactive accumulation of relevant knowledge”(Wei X, 2016).Students majoring in translation, particularly scientific and technical translation, need to develop terminological awareness progressively during their undergraduate education. Scientific and technical translation encompasses a wide range of specialized fields, including computer science, mechanical engineering, materials science, energy engineering, bioengineering, and earth science. A substantial proportion of the translation process is devoted to term identification and translation. Since translators cannot acquire comprehensive subject-matter knowledge across all disciplines, sound terminological awareness and term-recognition competence are essential for the accurate handling of interdisciplinary terms(Zheng A, 2016). Learners with terminological awareness are more likely to evaluate, trace, and verify proposed translations actively. This helps reduce mistranslations, omissions, and the use of nonstandard term designations, thereby improving the overall quality of translated texts.

Compared with General English courses, English for Specific Purposes (ESP) courses provide a primary setting for the cultivation of terminological awareness. ESP refers to English teaching associated with a particular profession, academic discipline, or specific communicative purpose. Its course objectives, instructional content, and teaching methods are expected to be designed around learners’ actual needs(Waters et al., 2002). General English courses primarily focus on developing fundamental language knowledge and general communicative competence. They therefore tend to have limited capacity to present the conceptual systems, specialized discourse, and terminological practices of a particular professional field in a sustained manner. ESP courses, by contrast, are explicitly oriented towards professional needs. They provide learners with authentic specialized texts and communicative tasks, integrate language knowledge with subject-matter knowledge, and consequently transform terminological awareness into observable and trainable practices(Leng B, 2019).At present, mainstream ESP textbooks generally retain the traditional structure of reading texts, vocabulary lists, analyses of difficult sentences, and comprehension questions. Vocabulary instruction often remains limited to providing Chinese–English equivalents, explaining basic meanings, and requiring students to memorize specialized terms. However, if ESP instruction fails to examine the intrinsic characteristics of specialized language and merely

transplants general English teaching models into specialized texts, it is unlikely to achieve a genuine integration of language learning and professional content.

Existing research on terminological awareness has largely concentrated on postgraduate translation education, particularly on the development of terminology courses for Master of Translation and Interpreting (MTI) programs, the components of terminological competence, and the cultivation of professional translators. By comparison, terminological awareness has rarely been established as an explicit instructional objective in undergraduate ESP education. Current teaching practices tend to emphasize the explanation of specialized vocabulary and the comprehension of texts, while paying insufficient attention to the conceptual relations underlying terms, their naming patterns, and their contextual use.Against this background, the present study focuses on Mechanical English instruction for lower-year undergraduate students majoring in scientific and technical translation. On the basis of an analysis of the principal characteristics of Mechanical English terminology, it explores pedagogical approaches appropriate for cultivating terminological awareness at the undergraduate level. The study aims to facilitate a transition in Mechanical English instruction from the memorization of terms towards conceptual understanding, active discrimination, and standardized use.

2. Major Characteristics of Mechanical English Terms

2.1 Dependence on Specialized Concepts and Systematic Organization of Knowledge

Mechanical English terms are highly dependent on specialized concepts. Terms are conventional linguistic designations of concepts in mechanical engineering. All terminological work should begin with conceptual analysis, with the aim of clearly distinguishing the boundaries between different concepts(Wüster E, 2011). Many commonly used words in mechanical engineering can be accurately understood only with the support of relevant subject-matter knowledge. Without an understanding of the conceptual distinctions involved, students may find it difficult to make accurate judgments in specialized texts, even when they know the basic meanings of the individual words.

Mechanical engineering terminology is also systematically organized within a broader knowledge structure. Terms frequently form conceptual networks through relations of superordination and subordination, whole and part, process and result, cause and effect, and opposition. Terminological awareness concerns not only the number of terms an individual has acquired but also their understanding of the knowledge system represented by those terms and their ability to define and organize terms through systematic conceptual thinking(Qian C et al., 2023).

Mechanical English terms should therefore not be treated as isolated lexical items but as nodes within the knowledge structure of mechanical engineering.

Mechanical English terminology frequently reflects relations of opposition, in which the meanings of concepts are mutually exclusive or complementary. Terms with clearly contrasting or closely associated meanings are common because mechanical engineering frequently involves activities, processes, and properties that are opposed to or correlated with one another. Terms also exhibit hierarchical relations of superordination and subordination, whereby a broader concept contains several subordinate concepts. Such relations produce numerous “families” of terms organized around shared conceptual categories. Only after establishing a basic conceptual network can students draw on their existing knowledge to infer the meanings of unfamiliar terms when reading new texts and make terminological choices in translation that conform to the logic of the discipline.

2.2 Regularity of Word Formation and Motivation in Term Naming

Mechanical English terms are highly analyzable in their linguistic forms. A considerable proportion of them are formed through compounding, derivation, conversion, abbreviation, and borrowing. Their morphological and structural features can therefore provide learners with clues to their meanings. In research on the teaching of maritime English terminology, scholars have incorporated conversion, compounding, derivation, abbreviation, and borrowing into ESP terminology instruction. They argue that analyzing the ways in which terms are formed can help students understand the processes through which terminological meanings are generated and can increase their interest in learning (Fan Y, 2015). This approach is equally applicable to the teaching of Mechanical English terminology.

Mechanical engineering terms also demonstrate clear motivation in their naming. Term designations are not invariably composed of arbitrary linguistic signs. Some terms are motivated by the shape, function, or operating principle of a technical object, while others derive from the name of an inventor, a geographical origin, or a particular social and historical background. Investigating the motivation underlying term formation can help learners understand the relationship between specialized language and its sociocultural context, thereby improving the accuracy and appropriateness of their specialized communication (Leng B, 2024). Students may first examine the structure of a term by identifying its headword, roots, affixes, and abbreviated forms. They may then use their subject-matter knowledge to infer the concept before verifying their interpretation through authoritative definitions and authentic contexts. For terms with distinctive naming origins, students may further investigate the relevant function, physical form, person, geographical location, or

historical background. In this way, linguistic analysis can be integrated with both subject-matter and cultural knowledge.

2.3 Standardized Use and Context Dependence

In professional communication, Mechanical English terms are characterized by both standardized use and context dependence. Since terms are conventional designations of specialized concepts, their use cannot be determined entirely according to an individual translator's preferences. In technical standards, product manuals, engineering drawings, and academic papers in particular, terminological consistency and standardization directly affect the accuracy of information transmission. Translators need to understand the concepts represented by terms, the processes through which terms are named, and the principles governing term translation. Where standardized translations already exist, established usage and terminological consistency should be taken into consideration (Qian C et al., 2023).

Terminological standardization does not mean that a concept can always be represented by only one fixed linguistic form. Modern terminology studies recognize that terminological variation occurs in authentic communication. Such variation may result from the sharing of terms across disciplines, differences in register, the communicative requirements of a text, regional differences in naming, and differences arising from the development of disciplinary knowledge and cognition (Xia J et al., 2021). For example, a term may be presented in its full form when it first appears and subsequently replaced by an abbreviation. The same concept may also be expressed differently in academic papers, corporate promotional materials, and technical manuals. Terminological variants may additionally perform cohesive and information-structuring functions within a text. To avoid repetition, specialized texts may use superordinate terms, subordinate terms, abbreviations, or simplified expressions to refer to the same concept. Moreover, specialized concepts do not necessarily correspond completely across languages. An English term may have a broader or narrower conceptual scope than its commonly accepted Chinese translation, while technological development may also change the conceptual content of a term. Translators should therefore avoid determining a term's translation in isolation from the conceptual contrasts, classifications, and relationships established within the text.

3. Approaches to Cultivating Terminological Awareness in Mechanical English

3.1 Terminology Instruction Based on the Construction of Conceptual Systems

Given the close relationship between Mechanical English terms and specialized concepts, terminology instruction should help students understand the disciplinary knowledge represented by terms and the internal relationships among relevant concepts. Teachers can begin

with conceptual systems and guide students beyond the linguistic forms of terms to analyze the technical objects they designate, their conceptual attributes, and their relationships with other terms. In this way, terminology learning can be integrated with the acquisition of mechanical engineering knowledge. In ESP classrooms, language functions as a tool for learning specialized content, enabling learners to acquire English while developing disciplinary knowledge and thereby reducing the separation between language learning and subject-matter learning (Xiong Z, 2018).

Conceptual-system instruction can begin with term definitions. Teachers may require students to locate definitions of a core term from multiple sources, including specialized textbooks, dictionaries for specific purposes, authoritative terminology platforms, industry standards, corporate technical documents, and academic papers. Students can then conduct a cross-source comparison of the definitions they have collected. Translating definitions is also an important component of conceptual understanding. When translating an English definition into Chinese, students need to identify the generic relationship, delimiting characteristics, and functional descriptions contained in the sentence. Teachers can guide students to examine their translations according to the structure of “genus plus differentia” and determine whether the conceptual structure of the original definition has been fully retained. On the basis of definition-based learning, students can be asked to construct term family trees or concept maps. A term family tree places a core term at its center and organizes its superordinate, subordinate, related, and contrasting concepts according to their respective relationships. During the mapping process, students must continuously determine whether the relationships among terms involve

classification, composition, or function, thereby deepening their understanding of specialized knowledge.

Taking the topic of “Anti-friction Bearings” as an example, teachers can construct a conceptual system centered on bearing and comprising definitions, classifications, components, functions, and performance parameters. Students may first extract the definition of anti-friction bearing from the text, identifying bearing as its superordinate concept and “the transmission of loads primarily through rolling contact rather than sliding contact” as its distinguishing characteristic. Teachers can then guide students to compare the referential relationship between anti-friction bearing and rolling bearing in the text and discuss why the author considers the designation anti-friction to be not entirely accurate. This discussion helps students recognize that the relationship between a term designation and its concept is not always completely transparent and that established industry terms may preserve certain historical characteristics.

After clarifying the core concept, students can construct a concept map of bearing terminology based on the textbook passage. According to the direction of the load carried, bearings can be classified as radial bearings, thrust bearings, and combined-load bearings, which can carry both types of load. According to the type of rolling element and structural configuration, subordinate concepts can be further organized to include ball bearings, straight roller bearings, spherical-roller thrust bearings, needle bearings, and tapered roller bearings. A whole-part relationship can also be established around the concept of ball bearing, with the outer ring, inner ring, balls or rolling elements, and separator identified as its basic components. Related structural terms such as groove, filling notch, shield, and seal can then be added to form a term family centered on bearing.

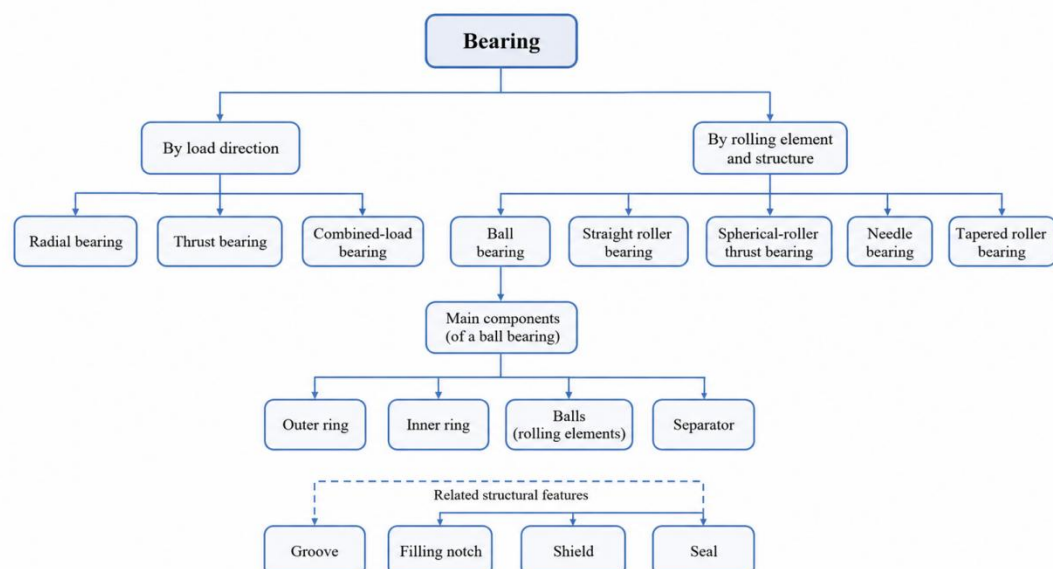


Figure 1. A Concept Map of Bearing Terminology Based on Conceptual Relations

3.2 Terminology Instruction Based on Word-Formation Patterns and Naming Motivation

In response to the morphological and naming characteristics of Mechanical English terms, terminology instruction can incorporate activities involving morphological analysis, semantic inference, and investigation into naming backgrounds. Such activities enable students to understand both the linguistic forms of terms and the specialized meanings and formation mechanisms underlying them.

In morphological analysis, teachers can select representative mechanical engineering terms and guide students to examine their internal structural relationships rather than simply accepting established translations. For example, the term electroplating consists of three components: electro-, plate, and -ing. The prefix electro- conveys the meaning of electricity or electrochemistry, plate refers to the action of covering a surface with a metallic layer, and -ing indicates the relevant technical process. By relating this structure to surface-treatment technologies in mechanical manufacturing, students can further understand electroplating as a process in which a metallic coating is deposited on the surface of a component through electrochemical principles to improve its corrosion resistance, wear resistance, or other surface properties. Through the analysis of internal term structures, students can gradually develop an awareness of how word-formation information can support the interpretation of unfamiliar terms.

In addition to analyzing the structure of terms themselves, teachers can guide students to observe semantic changes that occur when general-language words enter specialized fields. In Mechanical English, some terms originate from everyday vocabulary but acquire specialized meanings through long-term professional use. For example, apron commonly refers to a garment worn to protect the front of the body, whereas in the context of a lathe it designates the assembly attached to the carriage that contains mechanisms for controlling its movement, commonly translated into Chinese as “溜板箱.” During instruction, teachers can use a structural diagram of a lathe and relevant textual examples to help students compare the general and specialized meanings of the word and analyze the connections between them in terms of position, shape, or function. Through this process, students can recognize that terminological meanings may develop through specialization on the basis of existing cognitive associations.

Some mechanical engineering terms also preserve information about technological development and industrial history, making it possible to investigate the background of their naming. For example, the term Phillips head screw derives from the name Henry F. Phillips and records the role of a particular historical figure in the promotion and

industrial development of the cross-recessed screw. Teachers can ask students to consult relevant materials and explain the origin of the term, the technical object it designates, and its relationship with the established Chinese translation.

3.3 Terminology Instruction Based on Problem-Driven and Collaborative Inquiry

Terminological awareness ultimately needs to be transformed into learning practices through authentic problems and specialized discourse. For lower-year undergraduate students, problem-driven learning can be adopted, with specific terminological problems serving as the starting point of instruction. Students can then be guided to explore the relevant field actively through source reading, group discussion, and the presentation of findings.

Problem-driven learning emphasizes learner-centered instruction. Authentic or near-authentic problems encourage learners to search for information, integrate knowledge, and solve problems collaboratively. Problems and projects can facilitate learners' independent construction of knowledge while integrating language learning with specialized content and practical tasks (Du Q, 2023; Tao Y, 2020). In Mechanical English terminology instruction, problems should involve conceptual conflicts, differences between translations, or context-dependent judgments, so that students cannot obtain an adequate answer simply by consulting a general-purpose dictionary.

For example, a teacher may ask: “Why can welding be translated as the general term ‘焊接’ in some texts, but may need to be understood as ‘熔焊’ when it occurs alongside soldering and brazing?” To answer this question, students need to read classifications of joining and welding technologies, understand the differences among these processes in terms of temperature, material state, and joining method, and then determine the meaning of the term in a particular sentence. Another possible question is: “The terms stress, pressure, force, and load may all be associated with the Chinese concepts of ‘力’ or ‘压力’; are they interchangeable in mechanical engineering?” Students need to consult specialized definitions, read texts in mechanics of materials or fluid mechanics, and form conclusions through systematic comparison.

Teachers should provide reading materials at different levels of difficulty. Basic materials may include textbook passages, concise English-language technical introductions, definitions from specialized dictionaries, information published by authoritative institutions or leading enterprises in the relevant industry, and necessary background explanations in Chinese. These materials provide all students with the essential information required to complete the task. Students with a stronger interest in a particular topic or a higher level of English proficiency may additionally read English-language academic papers,

technical standards, patent documents, and corporate white papers in order to observe terminological usage in more complex forms of specialized discourse.

Group collaboration is an important organizational component of problem-driven instruction. Depending on the task, teachers may assign roles involving information retrieval, English-language reading, verification of Chinese term equivalents, collection of contextual examples, concept-map construction, and presentation design. Group members should be required to discuss the central question collectively and reach a unified conclusion supported by evidence. During group discussions, teachers should provide question-based scaffolding to help students move from information collection to evidence comparison and conceptual judgment, preventing classroom activities from remaining at the level of merely reproducing information.

The outcomes of inquiry can be presented in various forms. Groups may construct term-family diagrams to display the hierarchical and associative relationships surrounding a core term. They may complete terminological concept cards recording the English term, Chinese equivalent, specialized definition, related terms, authentic contexts, translation issues, and reference sources. They may also produce tables of terminological variants explaining the register and textual functions of different expressions.

More advanced tasks can be introduced for students with sufficient interest and ability. Students may build a small comparable or parallel corpus around a particular term and examine its collocations and translations in Chinese and English academic papers, corporate websites, and technical standards. They may use tools such as AntConc to analyze the words occurring before and after the term in corpus data. They may also compare translations generated by artificial intelligence, equivalents provided by general-purpose dictionaries, and expressions found in specialized corpora. Such tasks can establish a foundation for students' subsequent study of corpus linguistics and computer-assisted translation.

4. Summary

Terminological awareness is essential to Mechanical English learning and scientific and technical translation. Mechanical English terms are conventional designations embedded in the conceptual system of mechanical engineering. Their interpretation depends on specialized concepts, conceptual relations, word-formation patterns, naming motivation, standardized use, and context dependence. This study identifies three major characteristics of Mechanical English terminology: dependence on specialized concepts and systematic organization of knowledge, regularity of word formation and motivation in term naming, and the coexistence of standardized use and context dependence. Accordingly, it proposes three teaching

approaches: constructing conceptual systems, analyzing word-formation patterns and naming motivation, and adopting problem-driven and collaborative inquiry. These approaches can help students move beyond memorizing Chinese-English equivalents and develop stronger abilities in term identification, conceptual analysis, verification, translation, and standardized use. They also support the integration of language learning and subject-matter knowledge in ESP classrooms.

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