

Path Exploration of Machine Translation Post-Editing Curriculum Construction in Vocational Undergraduate Education

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Abstract. This paper catches the key words about Vocational Undergraduate Education, machine translation and post-editing (MTPE) in the decade of 2013-2022, and analyzes their development trends, benchmarks through analyzing the current situation of the MTPE course for Applied English majors in Vocational Undergraduate Education and the necessity of the course setting with the help of VOSViewer software. Preliminary conception and exploration of the elements of the MTPE course design ideas, target positioning, course framework and course evaluation have been conducted, aiming at responding to the Ministry of Education's curriculum planning for the introduction to Applied English majors for Vocational Undergraduate Education--Machine Translation Post-Editing, which provides a referential path for talents training and curriculum transformation.

Keywords. Vocational Undergraduate Education; machine translation post-editing; curriculum design

1. Introduction

Vocational Undergraduate Education began with the needs of the times of industrial transformation and upgrading and labour market restructuring. Skilled technical talents cultivation featured with versatile, high-level, and application-oriented characteristics of technical skills personnel training requires the development of undergraduate and higher levels of vocational education. At the beginning of 2021, the introduction of the Administrative Measures on the Establishment of Undergraduate Level Vocational Education Majors (Trial) marked the official launch of China's Ministry of Education for the establishment of undergraduate majors in vocational colleges as well as the formal establishment of a national system for the major settings in Vocational Undergraduate Education. It also marks that Vocational Undergraduate Education has finally moved from research to comprehensive practice after years of verification. In September 2022, China's Ministry of Education published a vocational education profession profile (2022 revision). By comparing applied English majors offered by junior colleges and undergraduate ones, it is found that undergraduate education put high requirements for the traditional English majors transformation in terms of career orientation, objectives, professional competence requirements, professional courses, internship training and practice, professional certificates, and continuing courses. "Machine Translation Post-

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Translation Editing (hereinafter referred to as MTPE)” was added to one of the core courses, and MTPE project training was put into the internship training session. Those changes highlighted the technical skill position, which bring about a clearer professional orientation for the field of linguistics in vocational education. The future career positions in language subjects are more clearly oriented, with translation as the main line of professional competence training and the increasingly urgent requirement for the development of technical translation skills.

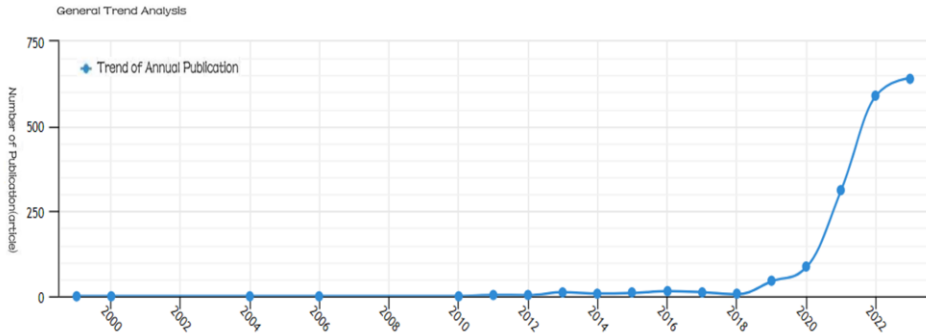


Figure 1 Developmental of Vocational Undergraduate Education in China

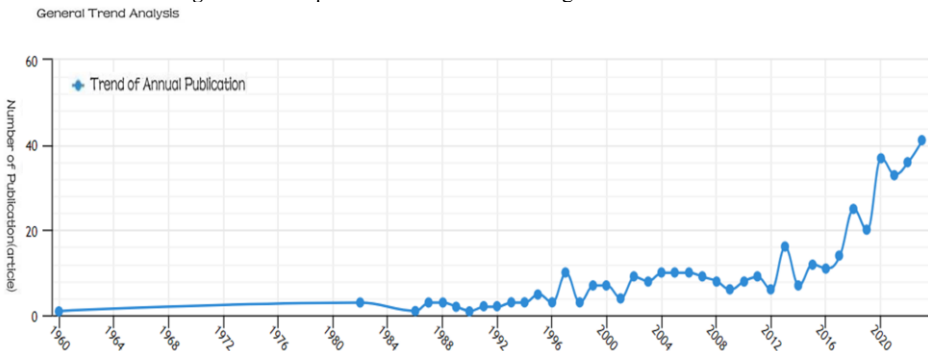


Figure 2 Developmental Trend of Machine Translation Post-Translation Editing

Inserting key words “Vocational Undergraduate Education”, “Translation ” in CNKI in Figure 1 and “Machine Translation Post-Editing” in CNKI in Figure 2, and Comparing both of them, whose vertical axis shows ‘Number of Publication(article)’, we can find the undoubted facts that:1. Vocational Undergraduate Education indeed has shown great booming in China, there are 1231 papers focus on its development, which has provided us with great opportunities and hope. However, when the key word MPTE is inserted, we find that though the general tendency is uprising, specific researches have shown weakness. There are only 372 papers that concentrate on MPTE research. There still exists great room for our Vocational Undergraduate Educational teachers to explore. Therefore, we resort to the VOSViewer to conduct a relatively thorough analysis of the two key phrases: MTPT and Vocational Undergraduate Education, the results have proved that more changes and researches are in great need.

In order to explore the research dynamics and research hotspots of the construction of the vocational undergraduate “Machine Translation Post-translation Editing” course in China and abroad, an exhaustive crawl of the core database on Web of Science (hereinafter referred to as WOS) during the decade of 2013-2022 on issues related to vocational undergraduate machine translation post-translation editing was conducted with the help

When analyzing the visual density section of VOSViewer in Figure 4, we found that this decade's research on MTPE has focused on modules such as pre-translation proofreading, eye-tracking, brain-neural machine translation, natural language processing, corpus, and post-translation proofreading automation. From the nature of the current research institutions, most of those who have made significant progress in the field of MTPE are science and technology majors, and the results mainly present two major characteristics: firstly, it is easier to develop MTPE in multiple dimensions through the cooperation of institutions; secondly, the cooperation between schools and enterprises has led to the rapid transformation of research results. How to do a good job in teaching English-Chinese translation courses in relation to natural language processing and promote the deep development of machine translation post-editing in vocational undergraduate programmes is a key point to be explored by the front-line teaching staff of vocational undergraduate programmes.

2. Literature Review

Since its embryo in the 1930s, machine translation has been continuously evolved and updated. In 2015, neural network machine translation (NMT) was on the rise. Subsequently, well-known Internet companies such as Google, Microsoft, Sogou, and NetEase launched their own neural network machine translation engines, which quickly became popular language service products. Researches show that the output quality of neural network machine translation has improved significantly compared to that of statistical machine translation based on a bilingual parallel corpus translation model. However, there are still many common mistakes such as mistranslation, leaking translation, contextual inconsistencies, and inconsistent terminology, which are more prominent in more detailed vertical fields. Therefore, post-translation editing with human intervention has become an inevitable important part after the machine translation finishes the translation tasks.

According to the definition of the Translation Automation Users Association (TAUS), MTPE is a complex language process that requires editing the original text automatically generated by a machine translation system. Screen [2] states that MTPE usually uses as few human resources as possible to achieve higher efficiency than human translation. In National Standard (GB/T 40036-2021/ISO18587, 2017) [3], MTPE is defined on basis of machine translation results, with the aim of checking the accuracy and comprehensibility of machine translation, improving the text, enhancing the readability of the text, and correcting errors. The goal of post-translation editing is oriented to be recipients or consumers. Therefore, it'll be acceptable if the recipients or consumers or users think that the quality of the translation can meet their own requirements. Therefore, the judgment criteria of MTPE quality become more flexible. The types of MTPE can be generally distinguished by the degree of human intervention in machine translation. There are two main categories, including full post-editing and light post-editing. The outcomes of full post-editing should be accurate, understandable, and appropriate in style, using proper syntax, grammar, and punctuation, with the aim of producing translations that have the same effect as human translation products. Meanwhile, light post-editing may use the original machine translation results as much as possible to ensure that no information is added or omitted. The light post-editing task is to modify inappropriate contents and restructured incorrect or unclear sentences. Professional undergraduate talents focus on integrated technical skill management and service ability development for node positions

in specialized fields. We propose that post-translation editing in the new MTPE course for undergraduate careers focuses on the proofreading of machine translation translations, which is closer to light post-translation editing in post-translation editing categories, that is, using the original product of machine translation as much as possible then to correct obvious errors and make the text easier for readers to understand. The focus of post-translation editing task is on revising the content of mistranslation, significant cultural differences, and reorganizing sentence structures. Light post-editing is post-editing with minimal human intervention, so the post-translation editing mentioned in this paper can be considered as light post-editing.

3. MTPE Course Design

Curriculum building is the foundation for the implementation of talent training and development. Liu Chengyou[4] proposed adhering to the guiding idea that Molding High Morals and Cultivating Talents Based on People Orientation, Attributes of Vocational Education and Higher Education should be integrated into the entire implementation process of Vocational Undergraduate Education, and Liu also emphasized that curriculum construction should adhere to the basic principles of “combining virtue and skill, placing equal emphasis on theory and practice”, “industry-education integration and work-integrated learning” and “student-centered”. Lu Jiancai[5] emphasized the need to follow the rules for cultivating skilled talents, construct a curriculum system and develop courses based on analysis of work tasks and professional abilities to refine the course development process and deepen the degree of school-enterprise cooperation. Yang Xinbin[6] proposed the establishment of a “technology-driven, product carrier, theory-practice integration, competency-based” curriculum system, implementation of a three-semester system with comprehensive practical courses, deep integration of industry and education, and further promotion of the “three teachings” reform, as an entry point and breakthrough for deepening content construction and improving the quality of teaching. Vocational Undergraduate Education should reflect the rank of undergraduate level on basis of adhering to professionalism. The course content requires deepening the knowledge study of technical theory, the cultivation of technological innovation ability, and the training of research and practical competence. From our point of view, the study conducted by Liu Chengyou[4] and Lu Jiancai[5] only provides the basic principles and guiding ideas for curriculum construction, no deep illustration and comments on course settings and strategies. Then, the course structure proposed by Yang Xinbin[6] highlights the professional characteristics of integrating industry and education, emphasizes the work procedures such as occupation, position, technology, skills, product and competence. Yang’s discussion is relatively comprehensive and systematic, which has the practical reference value to some extent, and can be applied to the design of the MTPE course. Therefore, we propose MTPE course ideas and framework featured with “Light post-editing technique driven, Applied translation product carrier, Translation theory-practice integration, Translation competence training targeted” (see Fig 5).

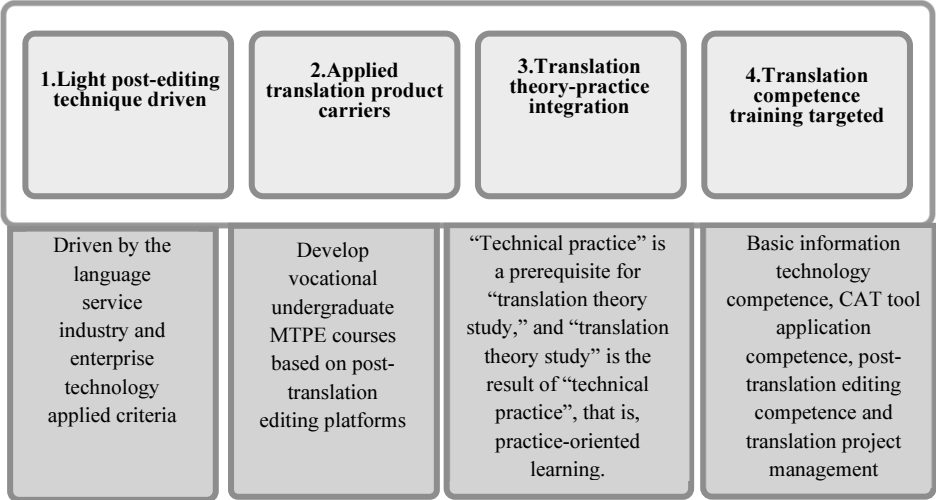


Figure 5 MTPE Course Design for Vocational Undergraduates

A. Light post-editing technique driven

MTPE in Vocational Undergraduate Education is light post-editing. Driven by the language service industry and enterprise technology applied criteria, MTPE course design should start from analyzing certain technical fields involved in the translators’ work, analyze their relevant technical knowledge, then select and organize course content based on the work process and technological innovation process of the translators’ post-translation editing practice. Meanwhile, the breadth and depth of technical knowledge should be laid emphasis on reaching the undergraduate level, that is, theoretical knowledge range may mainly cover from machine translation, post-translation editing to computer-aided translation, combining “vocational character” with level” while adhering to the professionalism.

B. Applied translation product carriers

When we develop vocational undergraduate MTPE courses based on post-translation editing platforms, some points need to be paid attention to. First, it is necessary to pay attention to select the typical post-translation editing platform, so that the platform can integrate the main technical knowledge of professional learning, and can be representative in the language service industry and enterprise production to ensure the integrity of translation technical knowledge learning. Second, it is essential to conduct practical process analysis based on post-translation editing platforms, which may include machine translation engine selection, post-translation editing strategy selection and terminological database application to ensure the matching between MTPE course and future work. Third, after post-translation editing practices, it is necessary to restructure course knowledge and competence system, design the relevant teaching and learning modules and form course framework and plan to ensure the inner logicity and systemization according to the whole MTPE task requirements.

C. Translation theory-practice integration

The integration of theory and practice in post-translation editing and proofreading of machine translations does not negate the importance of theoretical learning, but on the contrary, for Vocational Undergraduate Education, theoretical learning of translation should be of considerable breadth and depth; “technical practice” is a prerequisite for “theoretical learning of translation”, which is the result of “technical practice”, i.e. practice-oriented learning. The main position of practice in course of integration of theory

and practice can better realise the unity of teaching objectives in terms of results and performance, and the unity of teaching implementation in terms of integration and contextualization.

D. Translation competence training targeted

The key element of MTPE course design is based on the core attributes of the subject. It is necessary to construct a translation technical competence model with Chinese characteristics that conforms to the foreign language talents training standards of Vocational Undergraduate Education. Wang Huashu and Wang Shaoshuang[7] believed that modern translators' translation competence included basic computer competence, information retrieval competence, CAT tool application competence, terminology competence and post-editing competence. Wang Shaoshuang and Qin Jianghua[8] built a translation technology knowledge framework composed of ten major sections, including basic knowledge, search technology, corpus technology, machine-assisted translation technology, machine translation technology, localization technology, terminology management technology, technical document writing, translation management technology, and other auxiliary technologies. Cui Qiliang[9] proposed that translators' technical competence should consist of information technology application competence, translation technology application competence and translation management technology competence. Based on the above analysis, we believe that the translation technical competence of vocational undergraduates should consist of four aspects which are basic information technology competence, CAT tool application competence, post-translation editing competence and translation project management competence (see Fig 6). Basic information technology competence includes basic computer competence and network search competence. CAT tool application competence includes the ability to use CAT tools, corpus technology, terminology management technology, quality assurance technology to complete actual translation tasks. Post-translation editing competence includes the use of machine translation technology, mainstream post-translation editing platforms and translation competence to complete post-translation editing tasks. Translation project management competence includes the ability to efficiently complete large-scale translation projects by using project management technology and team collaborative translation technology.

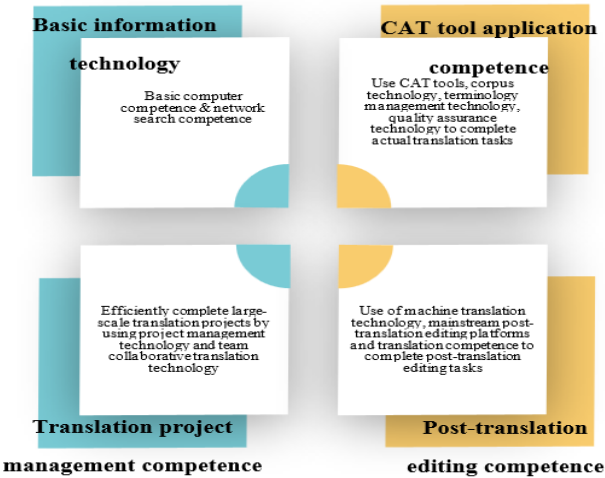


Figure 6 Translation Technical Competence of Vocational Undergraduate Education

4. MTPE Course Orientation

The Vocational Education Professional Profile (2022 Revision) [10] states that the vocational undergraduate applied English majors aims to train talents with high-level technical skills for comprehensively developing morality, intellect, physical work, beauty and labor abilities, mastering solid scientific cultural knowledge, English language foundations, basic translation theories and commonly used translation methods, knowledge of international trade business and relevant laws and regulations, owing strong language expression ability, on-site interpretation and data translation ability, foreign-related business processing, having the professionalism and information literacy of excellence, and being capable of excellence in business English translation, post-translation editing of machine translation, international business and foreign trade business. The national standard (GB/T 40036-2021/ISO18587, 2017) [10] proposed six competencies for post-translation editors, including translation competence, language competence and word processing competence by using source and target languages, competence to research, obtain and process information, cultural competence, technical and domain competence. Feng Quangong and Liu Ming [11] proposed a three-dimensional model of post-translation editing competence that includes cognitive dimension, knowledge dimension, and skill dimension, which is also in line with national standards for post-translation editing ability. Based on this, as a core professional course and internship training practice course for applied English majors, we believe that the general goal of MTPE course needs to combine the two dimensions which are English major standards for vocational undergraduates and national standards for post-translation editing competence in order to cultivate students to understand the development of the language service industry, market demand and post-translation editing competence, master translation project management workflows, and be proficient in using mainstream post-translation editing platforms to apply practical post-translation editing competence into machine translation projects (see Fig 7).

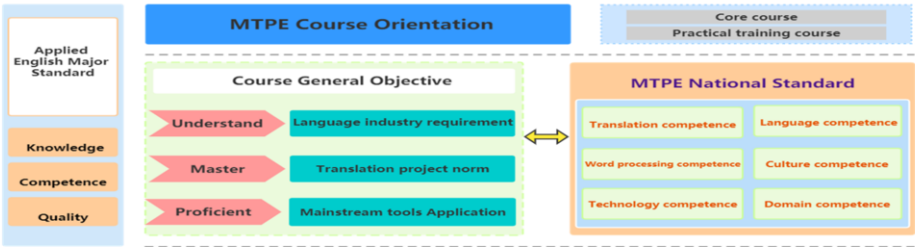


Figure 7 MTPE Course Orientation for Vocational Undergraduates

5. MTPE Course Framework

MTPE course can be conducted in various forms of teaching activities according to the characteristics of language major talents training model, current teacher status and development, teaching equipment and environment and depth of school-enterprise cooperation. Specifically, MTPE course can be divided into three model frameworks, that is, independent core course model, embedding translation course model, and internship training week course model.

A. Independent Core Course Model

Although post-translation editing seems to be editing machine-translated texts, in terms of the actual process of post-translation editing, the extension of post-translation editing should be widened to take pre-translation editing, post-translation editing, and general competencies into the overall systematic considerations. In detail, it should cover the cultivation of pre-translation text editing competence, post-translation text editing competence, and basic general competence. The independent setting of professional core courses generally requires 2 credits and 32 hours. For details, we can refer to Zhong Wenming [12] "Post-translation Editing Course Teaching Module" for adjustment setting. (see Table 1 for details)

Table 1 “Post-Translation Editing” Independent Core Course Model

Competence	Module	Content	Hour
Pre-translation text editing competence	Machine translation fundamentals	A brief history of machine translation; The concept of machine translation; The similarities and differences between MT and CAT;	2
	Common quality problems in machine translation	Common errors in current machine translation; Causes of machine translation errors; Methods for quickly locating common problems in machine translation	4
	Machine translation quality assessment	Indicators and methods for quality evaluation of machine translation	2
	Core skills for pre-translation editors	The purpose and role of pre-editing; The main strategies of pre-editing at the level of sentences, phrases and words (such as terminology)	4
	Mainstream post-editing tools/platforms	Online post-editing platform; Use of machine translation quality assessment tools; New interactive machine translation, integrated TM machine translation and automatic optimization of machine translation	2
Editing translated text competence	Principles of post-editing theory	The development history and industry status of post-translation editing; The general principles and business scenarios of post-translation editing	2
	Core skills of post-editing	Evaluation criteria of post-translation editing quality; Main strategies of in-depth post-translation editing; Main Strategies of Lightweight Post-translation Editing	4
	Post-translation editing project practice	Post-editing practices for documents in specialized fields (such as electronic information, technology, etc.)	6
Basic linguistic general competence	Project management	Project feasibility assessment, quotation and machine translation engine selection; Project time management/quality management/risk management	2
	Translation and intercultural communication	The role of translation ability in post-translation editing; Subject domain knowledge; Intercultural communicative competence	2
	General skills of translation technology	Basic text and image processing; Information retrieval; Office office basics	2

B. Embedding translation course model

In the early stages of course development, it is possible to explore post-translation content embedding models, so that traditional translation courses can be gradually transformed in the direction of language technology. Take the school-enterprise cooperative course between Shanghai Technical Institute of Electronics & Information (STIEI) and Shanghai Yizhe Information Technology Co., Ltd (YiCAT) as an example (see Table 2). The embedded content mainly includes six modules with 12 hours in whole. This content is taught by YiCAT staff who are sent to assist the STIEI in-class teaching activities. The first five modules focus on knowledge explanation to help students establish a knowledge system for machine translation and post-translation editing to cultivate students' post-

translation editing awareness. The sixth module simulates “Post-translating Science and Technology News on the YiCAT Platform” as a case project simulation, uses the current YiCAT online translation management platform retriever to complete post-translation editing of texts in the field of news technology, then exports and submits task reports in the platform.

Table 2 Post-translation editing course embedding in “Occupational English Chinese Contrastive Translation Course”

Module	Content	Hour
A brief history of the machine translation development	Development, classification, working principle and application field of machine translation	2
Overview of machine translation quality evaluation	Common errors in machine translation; Classification, content, criteria and methods of machine translation quality evaluation	2
Call of machine translation in CAT tools	The use of mainstream CAT tools; The choice of different machine translation engines; The retrieval of machine translation in CAT tools	2
AI technology combined with machine translation	New interactive machine translation; Integrated TM machine translation; Automatic machine translation selection	2
Common error types and skills in post-editing	Post-editing competence; Common strategies and skills	2
Practical exercises for post-translation editing projects	Post-translation editing of technology news on the YiCAT platform	2

C. Internship Training Week Course Model

Internship training course is the feature of vocational education, which aims to help students improve their skill level, refine the quality of students' will, and serve students' all-round development. Internship training is generally conducted and run on a continuous teaching week. After preliminary exploration of the course implantation model, because of the epidemic influence in Shanghai in early 2022, STIEI Spring Teaching Courses were all transferred to online classes. The 2-week 60-hour MTPE course was adjusted to the “Friday+Weekends” intensive training model, completed in rotation over three weeks, with the aim of cultivating students' post-translation editing awareness and improving students' practical ability. (See Table 3 for details)

Table 3 MTPE Training Week Course

Module	Time	Content	Hour
Machine-aided translation platform cognition	Friday	Introduction to computer-assisted translation concepts; Main functions of computer-assisted translation tools; Translation memory	4
	Saturday	Introduction to online translation management platform; Introduction to YiCAT platform; YiCAT online practice (1): project creation, configuration, simulation translation and review	8
	Sunday	YiCAT online practice (2): Teachers distribute classroom practice assignments; students intend to be familiar with the process of project creation and editor use; students complete the training assignments independently	8
	Friday	YiCAT Training Homework Comments;	4

Simulated translation project cases		Project Management Knowledge Introduction; Translation Project Management Introduction	
	Saturday	Translation project management Task (1): team creation, team collaboration translation, translation submission and export	8
	Sunday	Translation project management assignments (2): Translation project process summary, project analysis report production, teacher-student communication and teacher comments	8
Post-translation editing project practice	Friday	Introduction to the development history of machine translation; Introduction to post-translation editing concepts and categories; Explanation of common machine translation errors and revision strategies	4
	Saturday	Post-translation editing assignments are distributed; Teachers demonstrate post-translation editing operations on the YiCAT platform; Students practice post-translation editing assignments	8
	Sunday	Teachers review the difficult points of post-translation editing based on student work reviews; Students revise the translation according to the review suggestions, and answer questions about the homework	8

6. MTPE Course Assessment

Whether it is independent core course model, embedding translation course model, or internship training week course model, MTPE course assessment should be focused on the general objectives and course orientation, emphasizing assessing students' technical knowledge reserves of translation technology, translation project management workflow, and practical competence to use mainstream post-translation editing platforms to conduct post-translation editing projects (see Table 4). A comprehensive evaluation can be made based on students' classroom attendance, group project work, pre-course preview, in-class discussions, post-course exercises, post-course preparation, in-class discussions, post-course practical exercises, and post-translation editing project completion quality.

Table 4 MTPE Course Assessment Form

Content	Translation technical knowledge reserve (Machine translation, post-editing, computer-aided translation, corpus, terminological database)	Translation project management workflow	Post-translation editing project practice
Proportion	15%	25%	60%

7. Conclusion

Under the guidance of Vocational Undergraduate Education, foreign language major settings are aimed at new business formats, new models, and new occupations, bringing great prospects for language service industry and MTPE market. The establishment of MTPE course for vocational undergraduate applied English major is still in its infancy. This paper proposes preliminary thought on the four basic elements of building vocational undergraduate MTPE courses. However, there is still a limit in the curriculum system, teaching equipment and resources, MTPE teacher team building, and integration of industry and education. It is our expectation that more experts and scholars may turn their attention and help applied English major and MTPE course development of Vocational Undergraduate Education, making contributions to the construction of China's modern vocational education system.

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