

Original Paper

A Study on Translation Methods of Scientific and Technical Terms from the Perspective of Transknowletology—Take the English Rendition of “T’ien-kung K’ai-wu” Translated by E-tu Zen Sun as an Example

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Abstract

T'ien-kung K'ai-wu recognized as the first technological classic includes both agriculture and handicraft production. From the standpoint of transknowletology, this study examines how ancient science and technology terminology was translated in E-tu Zen Sun's English rendition of "T'ien-kung K'ai-wu." In accordance with the criticism tools and three criticism criteria for translation that were put forth by Professor Meng Xiangchun and Professor Yang Feng, the research findings elucidate the following characteristics of ancient science and technology terminology in "T'ien-kung K'ai-wu". Adhered to the principle of real meanings, the translator sought the genuine meaning within the "area of knowledge identity" and the "greatest common divisor" of knowledge. Under the premise of full preparations, the translator employed in-text interpretation and out-text explanation to facilitate communication and address the "scissors differential of knowledge" within the "area of knowledge discrepancy". Furthermore, under the principle of target text aesthetic conceptions, the translator could pay attention to the audience's aesthetics and "area of knowledge conflict", thereby fostering the "knowledge glocalization" come into being through free translation. The research findings hold significant value for the characteristics and techniques of translating scientific and technical terms in "T'ien-kung K'ai-wu" into English.

Keywords

scientific and technical terms in Ancient China, T'ien-kung K'ai-wu, Transknowletology, translation methods

1. Introduction

Ancient China attained a splendid scientific and technological civilization encompassing agriculture, medicine, mathematics, and astronomy. The level of scientific knowledge between the 3rd and 13th centuries in the West was challenging to rival. (Needham, 1955) "T'ien-kung K'ai-wu," recognized as one of the Four Great Technological Classics of the Late Ming Dynasty, provided a systematic summary of the production techniques across eighteen sectors in agriculture and handicrafts, marking the first comprehensive documentation of these practices in Chinese history prior to the late Ming period. The associated terminology has emerged as a significant vehicle for the transmission of Chinese scientific and technological civilization. The original aim of Song Yingxing was to utilize practical knowledge to bolster the late Ming regime, drawing from both classical texts and common knowledge for inspiration. Furthermore, utilizing the philosophical notion of the "unity of heaven and man," his status as a scholar had an impact on his literary style. The terminology related to science and technology in "T'ien-kung K'ai-wu" serves as a representation of traditional Chinese culture. The scientific and technical terminology found in "T'ien-kung K'ai-wu" embodies the accumulated thoughts, culture, and conceptual forms of the Chinese nation over successive generations. Examining the translation strategies employed for Chinese science and technology terminology serves to highlight China's brilliant scientific knowledge and rich scientific heritage to a global audience, providing insight into the scientific wisdom and cultural background of the Chinese nation. It also contributes to enhancing national cultural confidence.

From the standpoint of knowledge translation studies, translation can be conceptualized as the challenge of globally acknowledging local knowledge. Translation is the core mechanism for the production and circulation of knowledge in all forms. (Baker, 2018) Translation goes beyond the equivalence between languages and adds value. It brings new or revised texts to the target language, recognizes potential achievements for the source language and culture, and triggers valuable debates within the target language as new ideas are compared with existing ones. (Manning & Owen, 2018) According to Venuti, Translation is the process of re-expressing the content contained in the source language in the linguistic form of the target language. (Venuti, 1995) The practice of translation involves an interconnected and mutually transformative relationship between local and global knowledge. Within the framework of a shared world knowledge system, knowledge is interconnected, and communicable, thus local knowledge developed under particular historical circumstances also possesses differing levels of universality. The application, dissemination, and impact of diverse local knowledge fundamentally indicate the level of acknowledgment they garner within the global knowledge system. (Wei, 2023) The ancient Chinese technological classics serve as a repository of local knowledge that mirrors the advancement of ancient Chinese civilization and constitute an essential component of the global knowledge system. Applying the principles of knowledge translation studies to the translation of classic works and employing effective translation methods to convey the concepts of "real meaning," "full preparation," and "TT aesthetic conceptions," holds substantial

research and cultural significance in enhancing the understanding and promotion of Chinese culture, as well as in elevating the global recognition of Chinese indigenous knowledge.

While "T'ien-kung K'ai-wu" is a renowned Chinese classic, its language structure and expression methods significantly diverge from those of modern vernacular Chinese. To facilitate the dissemination of knowledge, translators must ensure that they translate with a precise comprehension of the original text, thereby aiding the target audience in understanding the content. It is crucial to comprehend the treatment and utilization of language in the process of knowledge production and other facets. (Tietze, 2021) The methods and theories employed in the practice of translation play a crucial role in the translation of classical works and are also significant subjects in the field of classical studies. At present, there is a paucity of research on translation methods for scientific and technical terminology within the framework of knowledge translation studies. It can be challenging to provide effective solutions that integrate local knowledge and global recognition.

In light of this, the present study utilizes E-tu Zen Sun's English rendition of "T'ien-kung K'ai-wu" as a case study to examine its globalized translation trajectory within the framework of the three logical principles of transknowletology. The objective is to increase the worldwide acknowledgment and appreciation of ancient Chinese scientific and technical knowledge and accomplishments, advance the translation of classical works into English, and facilitate the dissemination of Chinese narratives.

2. Overview of Transknowletology and the English Rendition of "T'ien-kung K'ai-wu"

2.1 The Main Connotation and Overview of Transknowletology

The foundation of transknowletology lies in the comprehension, transfer, and distribution of knowledge. The study explores the correlation among language transformation, discourse shaping, and knowledge construction, (Yang, 2022) drawing insights from the disciplines of epistemology, ethics, and aesthetics. The fundamental components of transknowletology encompass knowledge, language, and translators. The scientific methodology of this approach encompasses the pursuit of real meaning, full preparation and TT aesthetic conceptions, while its historical dimensions encompass culture, society, and politics. The logical principles encompass the pursuit of real meaning in knowledge, the establishment of righteousness through full preparation, and the eloquent expression of TT aesthetic conceptions. (Yang, 2021) Transknowletology centers on the process of converting local knowledge into global knowledge, exploring the process of translation within the historical contexts and frameworks of various knowledge communities. Transknowletology examines the behaviors, relationships, movements, and patterns involved in the processing, reconstruction, and dissemination of cross-linguistic knowledge. The theory also makes a thorough inquiry of the cultural context, social circumstances, and political climate in which knowledge is created and shared, encompassing language evolution and the development of concepts. Transknowletology is of considerable academic importance as it contributes to the understanding of China's global discursive influence and facilitates the international dissemination and integration of Chinese knowledge into the global knowledge system. (Yang, 2022).

The theoretical framework of transknowledgeology has garnered significant attention from scholars. A cohort of researchers, comprising Li (2022), Pang (2022), Qin (2022), Zhang (2022), Yue and Chen (2022), Lan (2022), and Chen (2022), has undertaken a comprehensive study to investigate and elucidate the implications, interconnections, and evolution of knowledge and translation in their scholarly works.

The standards of real meaning, full preparation and TT aesthetic conceptions in transknowledgeology have been expanded and elucidated in the present context. Under these standards, advocating for faithful translation aims to convey the original meaning of knowledge. Advocating for good translation takes into consideration the purpose and audience, facilitating communication between the translated text and readers. Furthermore, advocating for aesthetic calibration based on the target language ensures better reception of the original knowledge by the target language audience. (Meng, 2022)

Apart from the basic framework and core concepts, the concept and discourse construction of transknowledgeology are constantly evolving. Based on cross-cultural knowledge translation, there have been explorations of nine new concepts and discourses, including "knowledge co-creation," "knowledge convergence zone," "knowledge divergence zone," and "knowledge conflict zone." The elaboration of these related concepts has greatly enriched the research path of transknowledgeology.

2.2 Overview of the English Rendition of "T'ien-kung K'ai-wu"

"T'ien-kung K'ai-wu" is the first technological encyclopedia in China that deals with agricultural and handicraft production. It is acclaimed as the "encyclopedia of Chinese craftsmanship in the 17th century". The book has significant historical value in commemorating the labor production and craftsmanship spirit of our ancestors. It has been translated into multiple foreign languages and has become an important text for Western readers to gain a deeper understanding of the development of ancient Chinese agriculture, industry, and technology. It has also provided knowledge power to promote the scientific revolution in Europe and inspired countries such as Japan to embark on their own exploration of science and technology.

Research conducted in China over the last five years on the English translation of *Tiangong Kaiwu* has revealed a trend toward integration of foundation and application as well as inheritance and development promotion. *Tiangong Kaiwu* is a sci-tech classic that is a major repository of Chinese cultural memory and a technological and cultural gem passed down from the past to the present. As a result, local researchers are leading the charge to preserve history and promote creativity. In addition to concentrating on translation techniques and procedures, they consistently investigate the underlying philosophical concepts and Chinese wisdom.

Wang stands out among the many distinguished scholars who have been contributing to this field from a variety of angles. He has carried out a number of comparative studies on English translations of *Tiangong Kaiwu* based on different theories, with an emphasis on the translation techniques and strategies employed in the translation of terminology.

The precise ratios of transliteration, literal translation, word-by-word translation, free translation,

imitation translation, and enhanced translation that were employed in the three versions were presented by Wang and Xu. It was discovered that the "relatively complete semantic properties of scientific and technological terms" are still present in Li's version. Wang's translation, on the other hand, is "close to the cognitive style of English readers" and tends to be more fluid. Regarding Ren's translation, foreignization serves as its primary foundation. "Literal translation" is the translation technique most often used.

Currently, there are three English translations of "T'ien-kung K'ai-wu," by E-tu Zen Sun and Sun Shouquan, Li Qiaoping and Wang Yijing, and Wang Haiyan and Liu Yingchun, respectively. Research in the domestic translation field on the English renditions of " T'ien-kung K'ai-wu " mainly focuses on comparing and evaluating the translation strategies of one or multiple translations, such as those by Lu (2012), Wang and Xu (2020), and Wang (2022). However, there is still a lack of research on the translation methods of technical terms in "T'ien-kung K'ai-wu" from the perspective of transknowletology. Therefore, this study intends to categorize and analyze the characteristics of technical terms in " T'ien-kung K'ai-wu," explore its globalized English translation path based on the three logical rules of transknowletology, and summarize the translation methods, so as to better fulfill the dual responsibility of disseminating ancient Chinese scientific knowledge and spiritual wisdom and promoting Chinese technological civilization.

3. The Characteristics and Classification of Scientific and Technical terms in "T'ien-kung K'ai-wu"

Based on the 18 chapter titles of "T'ien-kung K'ai-wu,"encompassing "The growing of grains", "Clothing materials", "Dyes", "The preparation of grains", "Salt", "Sugars", "Ceramics", "Casting", "Boats and carts", "Hammer forging", "Calcination of stones", "Vegetables oils and fats", "Paper", "The metals", "Weapons", "Vermilion and ink", "Yeasts", and "Pearls and gems", this article defines the technical terms within these chapters as specialized expressions related to agricultural crop cultivation and processing, salt making, sugar production, oil extraction, silk weaving, dyeing, gold mining and forging, transportation, papermaking, weaponry, ink and paint production, and pearl and jade mining. The technical terminology in these fields carries unique Chinese cultural attributes, and the scientific and technological concepts they represent extend beyond their literal definitions, rendering them less universally comprehensible across different cultures and more challenging to grasp. The specific features they possess include:

Firstly, characterized by epochality. In the mid to late Ming Dynasty, there was a rapid development of the commodity economy, characterized by the introduction of new agricultural products from abroad and further improvements in traditional handicraft technologies. This period witnessed the emergence of a number of innovative terms such as "Potter's wheel (陶车)" (a mechanical device for pottery-making). The creation and disappearance of these terms coexisted, with some Ming Dynasty terms like "wo-ch'ien (倭铅)" (Japanese lead) and "hun-chiang-lung (混江龙)" (stationary submarine

mine) either falling out of use or undergoing changes in meaning over time.

Second, full of synonymy. Anecdotal research and reading classics are the main materials and sources for Song Yingxing's writing. Many scientific and technological terms have common and written names. The example is as follows.

Example 1

Source text: “其熏蒸旁溢者为自然铜，亦曰石髓铅” (Song, 2016, p. 407)

Target text: “Before smelting, copper ore is washed to eliminate earth particles. When heated in the furnace, that which melts and flows out is called ‘natural copper,’ or ‘stone marrow lead.’” (SIVIN, 1966, p. 244)

In this example, “natural copper” is the equivalent of “stone marrow lead”.

Thirdly, literary quality. Song Yingxing was well-versed in the classics and wrote works such as "Poems of Pity." In addition, the literary tradition values "rhetoric and sincerity," as well as literary charm, which involves linking scientific and technological terms with corresponding characteristics and making them vivid. Including "Early Chi-an 吉安早" (a variety of rice), "pheasant's roost 野鸡篷" (rudder tower), "river flounder 江鳊" (the name of the ship), "straw-sandal sole 草鞋底" (wood on both sides of the ship), and "Great commander 大将军" (artillery).

Fourth, be of historic significance. The scientific and technological terms of "T'ien-kung K'ai-wu", such as "wo-ch'ien (倭铅)" (Japanese lead), “the occidental cannon (西洋炮)”(his-yang p'ao), “red-barbarian cannon(红夷)”reflect the social reality and historical facts of the Ming Dynasty. These include the invasion of ethnic minorities in the late Ming Dynasty, the rebellion of the Japanese in the southeast, and the spread of Western learning to the east.

Fifth, ethnicity. China's distinctive geographical location, natural resources, and customs have led to the development of region-specific technical terms that differ significantly from those of other ethnic groups. For instance, "the His-an boats of Chekiang (东浙西安船)," "clear-stream boats(福建清流船)," and "the eight-scul boat of Szechuan (四川八槽船)" are distinctive types of transportation vessels and mineral resources found within China's borders.

Sixth, Philosophical. Song Yingxing, in his previous works such as "Outlines of Astronomy" and "On Qi," delved into philosophical topics. He developed the theory of "Two Qi and Five Elements" (Schäfer, 2019) and demonstrated intuitive and non-rationalist tendencies in "The Exploitation of the Works of Nature." This involved the exploration of Yin-Yang and Five Elements philosophy, as well as the use of terms such as "divine fire," "yin fire," and "five elements" to describe natural scientific phenomena and technological principles that were not yet explained at that time.

In conclusion, the cultural and technical terms in "T'ien-kung K'ai-wu" are closely intertwined with the history, thought patterns, values, aesthetics, and philosophical ideas of the Chinese nation. They possess complex characteristics that involve conceptual symbols and cultural contexts, serving linguistic, social, historical, and constructive significance. (Guo, 2008) The translation of scientific and technological knowledge into foreign languages not only aims to disseminate “universal values,” but

also carries the responsibility of facilitating communication between different civilizations.

4. Translation Methods of Scientific and Technical Terms in the English Version of "T'ien-kung K'ai-wu" from the Perspective of Transknowletology

"T'ien-kung K'ai-wu" is a crucial aspect of the global preservation and dissemination of ancient Chinese scientific and technological knowledge. It helps to showcase the characteristics and development of Chinese history and civilization in the field of science and technology. By reproducing and disseminating localized scientific and technological knowledge, particularly from the Ming Dynasty, it is transformed into global knowledge and facilitates the globalization of knowledge exchange. In this process, the logical, ethical, contextual, egalitarian, and aesthetic aspects of scientific practice and social construction establish the standards that govern the translation process. (Yang, 2021) This convention requires that translated works adhere to the principles of "real meaning," "full preparation," and "TT aesthetic conceptions." In "T'ien-kung K'ai-wu", Song Yingxing's knowledge generation pathway involves investigating the attributes of raw materials, production procedures, crucial techniques, manufacturing tools, and product attributes during the creative process. (Catford, 1965) Based on these principles, the following text will integrate the concepts of "seeking knowledge with real meaning," "establishing righteousness with full preparation," and "writing with TT aesthetic conceptions" with translation methods to investigate the translation of technical terms in "T'ien-kung K'ai-wu."

4.1 Seek the Genuine Meaning and the Greatest Common Divisor under the Principle of Real Meaning

The field of transknowletology advocates for the pursuit and dissemination of accurate and unadulterated knowledge. "Real meaning" refers to conveying the true meaning, which involves expressing the essence of knowledge and its semantic components. To achieve "fidelity" in translation does not mean that the words in the target language correspond faithfully to the words in the source language, but that the meaning conveyed in the translation is faithful to the meaning expressed in the source language. As Eugene A. Nida said, "Translating means interpreting meaning." (Babel, A,1975) Knowledge represents the accumulation of human exploration, discoveries, and experiences in both the physical and spiritual realms. In the realm of transknowletology, all content that requires translation is considered to belong to various types of knowledge. Adhering to the principle of conveying the true meaning, the translator firstly should have the knowledge, skills, and abilities to accurately comprehend the original text's emphasis on natural principles and laws. (Wang, 1992) This is also a prerequisite for accurately translating the true meaning. Secondly, the translator should faithfully reproduce the original text and restore its intended meaning, including knowledge of narrative styles, reflecting the ethical relationship of the translator's pursuit of real meaning from the original text. (Hu, Y. Y., & Tu, G. Y.) Although there are differences in world cultures, there are always areas of knowledge identity where people's objective experiences and localized knowledge accumulate and intersect. To seek real meaning in the diverse world cultures means to convey the true existence of the objective world by pursuing

genuine knowledge and maximizing the representation of practical activities in local cultures. This enables knowledge from different cultures to find common ground, resonate with each other, and seek the greatest common divisor. The translation methods that embody the pursuit of genuine knowledge and the transmission of unadulterated information mainly focus on literal translation, transliteration, word-for-word translation, and zero translation under the strategy of foreignization.

The ancient Chinese technology exhibited distinct localized knowledge characteristics in scientific thinking and practical methods. The naming of its fundamental concepts often reflected the coexistence of scientific and humanistic characteristics. (Liu & Wei, 2021) While foreignization translation strategies, such as literal translation, may not affect the acceptance of the readers, they can be used to convey the true meaning and knowledge. This can present the localized characteristics of Chinese culture in a more authentic manner to audiences from diverse knowledge domains.

Example 2

Source text: 若铅山诸邑所造柬纸, 则全用细竹料厚质荡成, 以射重价。最上者曰官柬, 富贵之家通刺用之. (Song, 2016, p. 332)

Target text: The stationery paper manufactured in such places as Ch'ien-shan in [Kiangsi] is made entirely of fine bamboo fibers and screened from a thick pulp. This paper fetches a high price on the market. The highest grade, known as "official stationery," is used as letter paper by high officials and wealthy persons. (SIVIN, 1966:329)

Analysis: In Jiangxi, the birthplace of Song Yingxing, Official stationery (官柬纸) was produced in locations like Qianshan (a county in Jiangxi Province). The raw materials were all made of high-quality bamboo and processed to produce paper. The highest quality paper was known as "Official stationery (官柬纸)" and was utilized by affluent and official households. It is evident that the "official stationery (官柬纸)" is an invention of ancient China in the field of papermaking. This invention also reflects the deep-seated hierarchical views of the Ming Dynasty and feudal society in China. In E-tu Zen Sun's translation, he employs the strategy of foreignization, using literal translation to clearly convey the initial layer of referential meaning. Furthermore, English readers can grasp the secondary layer of institutional meaning and comprehend the temporal context of ancient Chinese society through the contextual language. In the Contemporary American English Corpus (COCA), the term "stationery" appears 1294 times, while "letter paper" appears 16 times in relation to the term "柬". Therefore, E-tu Zen Sun's translation method aligns with the reading habits of most modern Western readers and adheres to the principle of conciseness.

4.2 Facilitating Communication under the Principle of Full Preparation

In the "Shuowen Jiezi," the definition of "善" (shàn) is given as "good" or "auspicious." It consists of the radicals 言 (speech) and 羊 (sheep). It has the same meaning as 美 (měi, beautiful). "善" can be understood as good, kind, compassionate, and charitable. For translators, practicing "Shan Yi" (good translation) means showing kindness and benevolence towards the target language audience. It emphasizes the effective transmission and communication of knowledge and culture during the process

of translation.

The information in the original work is specific to a certain location, whereas the translator's role is global. In the context of global culture, there are inevitable differences and unfamiliarity among diverse cultures, which we refer to as "knowledge difference zones." The object of translation is not language itself, but rather the value that arises from the communicative interaction between the two parties involved in the translation process. (Robinson, 2014) The term "translation knowledge" encompasses all the knowledge related to translation, including translation methods, translation consciousness, and translation potential. It includes both mental knowledge, dependent on conceptual skills and cognitive abilities, and embodied knowledge acquired through translation practice. However, it does not include the knowledge conveyed by translation, which refers to general, cultural, or historical knowledge, falling into the domain of knowledge translation. (D'hulst & Gambier, 2018) To meet the need for effective knowledge communication, translators must exceed expectations by providing relevant background information for the translation. The principle of full preparation requires that translators remain faithful to the purpose of translation, which is to transmit knowledge and help the audience understand the original information. Secondly, translators need to be well-prepared to facilitate communication, and the translation method should be conducive to conveying knowledge by appropriately explaining the knowledge system and taking the audience into full consideration.

Example 3

Source text: 牛在春分前用力耕地会出汗，这时要避免淋雨着凉，如果看天色感觉将要下雨，就得赶快将牛赶进牛棚。等到“谷雨”节气过了之后，天气逐渐变暖，再有风吹雨淋就都不用担心了。(Song, 2016, p. 34)

Target text: Prior to spring the ox must not be exposed to rain while he is perspiring from ploughing, and when it rains he should be driven to the barn immediately. He will be immune to wind and rain after ku-yü ["grain rains," a solar period between late April and early May] (SIVIN, 1966, p. 28)

Analysis: The paragraph mentions the term "谷雨" (ku-yü), which is one of the twenty-four solar terms. The twenty-four solar terms are a system of time knowledge and social practice developed by the Chinese based on the observation of the sun's annual movement. It is considered the "Fifth Great Invention of China" in the international meteorological community. The comprehensive and scientific summary of the twenty-four solar terms can be traced back to the book "Huainanzi - Astronomical Training (A Guide to the Theory and Practice of Government in Early Han China)." The ancients used the rotation of the handle of the Big Dipper to determine the seasons, establishing a comprehensive system of four seasons, solar terms, heavenly stems, earthly branches, and directions. (Wang & Deng, 2023) This system not only served as an important foundation for various significant events in governance, agriculture, worship, fishing, hunting, law enforcement, and military activities throughout Chinese history, but it was also a crucial aspect of adhering to the principles of nature and harmonious coexistence with nature in Daoist philosophy. In order to enhance readers' comprehension of the original text, E-tu Zen Sun included an in-text annotation after "谷雨(ku-yü)," defining it as "a solar

period between late April and early May." This contributes to a better understanding and appreciation of traditional Chinese culture among Western readers, facilitating the exchange of knowledge and culture between the East and the West.

4.3 Fostering the "Knowledge Glocalization" under the Principle of TT Aesthetic Conceptions

As the essential link between subject and object, "TT aesthetic conceptions" unveils the relationship between human beings and objects. The subjective feelings and experiences that arise when human needs and desires are fulfilled in objects are referred to as aesthetic appreciation. Different cultural groups often have their own aesthetic preferences when acquiring knowledge, which can result in variations and conflicts in the acceptance of knowledge or culture, leading to the creation of a "knowledge conflict zone." Translation studies prioritize the needs and preferences of the target language audience. Translators can adjust the translation process to align with the target language's aesthetic approach, aiming to facilitate effective knowledge communication and bolster global recognition. The process of "translating TT aesthetic conceptions" can also be understood as the interaction and acceptance of localized knowledge in a global context. This promotes cross-linguistic knowledge processing, reconstruction, and re-dissemination, as well as the interaction and globalization of knowledge.

To achieve stylistic TT aesthetic conceptions, translators should begin by thoroughly reading the original text and endeavoring to understand the original author's perspective. Then, they can translate it into a classic that conveys TT aesthetic conceptions, enabling readers to directly experience the artistic TT aesthetic conceptions of the original text. Secondly, they should carefully consider and improve the expression and presentation of the translated text, providing the audience with a journey of TT aesthetic conceptions. Finally, in the field of translation, practitioners should strive for TT aesthetic conceptions by studying, researching, and reflecting on the knowledge system and cultural aesthetics of the target language. By engaging in genuine and effective communication with the target language audience, translators can establish an ethical relationship that seeks to convey TT aesthetic conceptions in writing, resulting in a translation that embodies aesthetic appeal.

Due to the disparities in vocabulary usage and linguistic structures between Classical Chinese and modern Chinese, as well as other languages, the expression may cause confusion and lead to misunderstandings among audiences in different knowledge domains. By reorganizing sentence components and semantically reconstructing them to improve clarity and fluency, the readability of ancient Chinese scientific and technical terms can be enhanced. This will make it easier for audiences to appreciate their scientific and humanistic value.

Example 4

Source text: 盖去水非取水也，不适济旱。用桔 槔、辘轳，功劳又甚细已。(Song, 2016, p. 20)

Target text: They serve to eliminate excess water from the fields before planting rather than to irrigate and are, therefore, not suitable as a remedy against drought. As to other devices, such as the counterweight lever and pulley well, they are still less efficient. (SIVIN, 1966, pp. 11-12)

Analysis: "桔槔" and "辘轳" are wooden water-lifting tools that represent unique geographical climates and locally adapted agricultural irrigation techniques. "桔槔" utilizes the lever principle, which involves adding a long lever to an upright frame with a pivot point at the center and a weight suspended at one end, while a water bucket is hung at the front end. "辘轳" is constructed based on the principle of a wheel axle, with a vertical frame above the well, a handle-operated axle, and a rope wound around the axle, with one end of the rope attached to the water bucket. By turning the handle, the water bucket is raised and lowered to fetch water. Overall, in the translation, the use of paraphrasing is employed to convey their functional purposes.

5. Conclusion

The theory of "seeking real meaning for knowledge," "establishing righteousness for full preparation," and "practicing TT aesthetic conceptions for elegance" put forward by transknowletology emphasizes the translation criticism standards. It focuses on translating the essence of knowledge, compensating for knowledge differences, and paying attention to the aesthetic appreciation of the target language's knowledge. It aims to retain local knowledge and highlights the unique characteristics in the translation process, while also focusing on the interconnectedness and communication between local and global knowledge. This approach aims to build a bridge for knowledge communication and emphasizes constructing a beautiful process of knowledge transmission.

In this process, the knowledge exchange relationship between the translated and original texts is balanced, presenting a global trend of behavior characterized by "mutual observation, mutual embrace, and mutual progress." Based on this theoretical foundation, this study analyzes the tendencies of "real meaning," "full preparation," and "TT aesthetic conceptions" in the English translation of "T'ien-kung K'ai-wu" and explores the translation methods of ancient technological terminology. The study found that the translation method reflecting "seeking real meaning for knowledge" mainly focuses on alienation translation strategies such as literal translation, transliteration, word-for-word translation, and omission, emphasizing the transmission of local pure knowledge. The method reflecting "establishing righteousness for full preparation" mainly emphasizes domestication translation strategies, including in-text explanation and external annotation, requiring additional processing by the translator to facilitate communication. The method reflecting "practicing TT aesthetic conceptions for elegance" tends to favor domestication translation strategies, particularly paraphrasing, highlighting the importance of pursuing aesthetic appeal in the target language.

It is hoped that this research can enrich the application of knowledge translation studies, provide beneficial exploration for the translation of Chinese classics, especially in the realm of translating technological classics, and promote the transformation of ancient Chinese technical knowledge from local to global perspectives.

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