Translation as Epistemic Mediation: Contemporary Philosophical Challenges in the Transmission of Scientific Knowledge

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Abstract
Globalization increases the importance of scientific translation as a tool of knowledge exchange. This article explores its philosophical foundations and contemporary challenges, analyzing international data and legal documents. Scientific translation is defined as a meaning-oriented cognitive process requiring ethical responsibility. AI and machine translation are particularly significant concerns as their benefits entail risks to linguistic diversity, accuracy, and professional standards.
Key words: epistemology, ethics, globalization, information exchange, translation philosophy

Introduction

Issues related to the philosophical aspects of translation, including knowledge transfer and scientific translation, have entered research discourse since the 1950s. Scholars investigate not only the challenges of translating specific terms and overall translation accuracy but also the relationship between semantic content and verbal expressions within the text (Wilder, 1975). However, even five decades later, the concept of scientific translation remains undefined due to terminological ambiguities (Aixela, 2004). Philosophical aspects of translation are essential for the scientific field as a whole and knowledge transfer in particular, as they concern issues extending beyond mere information transmission.

Translation philosophy addresses numerous specific questions that may appear non-obvious within translation practice. For example, the ethics of translation treats the translated text as an independent entity characterized by a "presence mode" in which translation activities operate at a dialogical level (Pym, 2007). From both linguistic and philosophical perspectives, scientific translation is a far more complex process than the mere recoding of content: under conditions of synonymy, it can fundamentally change a text's meaning while preserving external correspondence (Ruitenberg, 2009). Researchers emphasize that translation philosophy is an integral part of translation studies, defining its role and objectives (Malmkjaer, 2010). This field continues to evolve, encompassing nearly all dimensions of translation and raising new questions.

Studies that explore the philosophical issues of scientific translation identify the linguistic environment as a natural and significant domain of cognition (Dupre, 2021). The linguistic environment forms knowledge and concepts that impact society at large, particularly as relevant terms and formulations become embedded in international documents (Palasz et al., 2025), including concepts directly related to science, such as bioethics, climate change, etc. Against the backdrop of globalization and the widespread dissemination of knowledge, relying solely on a linguistic approach to translation is insufficient to ensure that scientific knowledge meets contemporary demands.

A paradox around the philosophical development of translation as a communicative tool arose during 2019-2020, when social distancing became a necessity. Social life, work, and education transitioned to online formats, fostering intercultural communication (Saito, 2020), which in turn significantly increased the role of translation in information transfer.

In the twenty-first century, shifts in societal values have attracted growing attention to the linguistic and philosophical dimensions of scientific translation. The intellectual component of societal welfare and sustainable development has gained primacy over the material, as it shapes the creation of new resources and the rational use of existing ones (World Intellectual Property Organization, 2024). Knowledge exchange and technology transfer have become the primary drivers of the global economy, thereby broadening linguistic communication boundaries. Previously, translation-related challenges impeded multinational scientific research, keeping it largely confined to national platforms (Rojo, 2015). This concern is relevant not only to technical and natural sciences but also to the active exchanges occurring within the humanities and philosophy.

Another crucial aspect is the role of translation as a tool for disseminating scientific knowledge in both intercultural and intertemporal contexts (Olohan, 2007). As globalization drives progress, humanity increasingly confronts a situation in which the exchange of knowledge and technology has become vital to economic and social development and the stability of the global system (Chen, 2016). This also encompasses intercultural exchange, forming mutual understanding as a basis for constructing political relationships. Consequently, the philosophy of translation plays a role as significant as terminological accuracy or stylistic adherence. This aspect is particularly important in cases of so-called untranslatable constructs, where both lexical and cultural recoding are required to convey the author's thinking and understanding of the source or target culture (Heilbronn & Skilbeck, 2020).

Translation issues also intersect with the political aspects of social life, either facilitating or hindering integration and shaping psychological frameworks for self-expression and active social positioning (Dolzhikova et al., 2018; Saito, 2018). The term "crisis translation" has emerged from a significant phenomenon in contemporary international relations: the active assistance provided by both international and national institutions to countries in crisis (O'Mathuna & Hunt, 2020). Without entering directly into terminological debates, translation practice aligns with the needs of contemporary humanity amid expanding interaction and mutual assistance. In this sense, translation can be viewed as part of a humanitarian mission, which returns the discussion to the philosophical aspects of translation.

This study focuses on the philosophical problems arising from scientific translation at the current stage of development in both science and translation. It addresses questions of translation ethics and the role of the translator, understood not merely as content transfer but also as the facilitation of intercultural understanding.

Literature Review

Contemporary translation research regards the philosophy of translation as an established domain of scientific knowledge. This perspective does not imply that philosophy and translation studies previously existed in complete isolation from one another. On the contrary, each academic discipline is inherently grounded in philosophical knowledge and methodology (Kokkola, 2024).

Philosophical research in translation is a separate subject of study and can, therefore, form a basis for further scientific development. Herder's theory of translation is cited as one of the foundational philosophical doctrines in this field. While recognizing the need to accurately convey meaning in translated texts, the theory posits that mental differences may influence the way the original text is transformed during the translation process (Forster, 2018). Another line of translation theory focuses on ensuring the purity of information transfer and overcoming conflicts between languages (Arrosyid & Pradana, 2021). Comprehensive studies of translation theory rely on granular "fragmentation": the choice of translation method and type based on the purpose of the translation and the characteristics of the translated information. These approaches distinguish between philological and linguistic theories, sociolinguistic theories,

aesthetic theory, polysystem theory, etc. (Hutauruk et al., 2023). Nevertheless, the philosophy of translation is inseparable from translation studies, despite the fundamental differences between these two domains of knowledge (Weissbrod, 2009).
A defining feature of the twenty-first century is the unprecedented growth of communication that enhances the quality of education, knowledge exchange, and collaborative scientific endeavors. This development has transformed the global environment, allowing a significantly larger number of individuals to influence its changes and functioning (Mosleh et al., 2020). The dominant issues in translation are not related to vocabulary or linguistics per se, but rather to the embedded meaning in the information and communication. The absence of a communicative purpose undermines the social significance of translation, because language, as a medium of communication, cannot exist outside its social context (Martin & de Leon, 2020).
Contemporary research defines scientific translation as a specialized area of translation practice, involving both recoding of information and analysis of multiple factors. This approach is crucial when translating sensitive scientific texts, as an overly literal approach can impair comprehension (Al-Smadi, 2022; Lomaka, 2017). Another important aspect is the need to maintain relevance: the translator must not only formally transfer content but also select appropriate adaptive strategies to navigate potential cultural and other differences (Ilinska et al., 2019). Translation contributes to the dissemination of scientific knowledge and therefore demands accuracy, creativity, and the interpretation of information in line with cultural, social, and economic realities (Chen, 2016). Modern scientific translation often involves a re-evaluation of the conveyed and received information (Elshakry, 2008).
Translation is a crucial element of scientific knowledge within the broader context of knowledge dissemination. Practical evidence of this can be seen in the use of translated textbooks, which constitute a unique environment. These textbooks address linguistic aspects while also reflecting the culture and mentality of a particular people, their modes of thought, and the structure of knowledge and methods of its transmission. Furthermore, scientific translation often mirrors historical understandings of various phenomena (Xiangtao, 2007).
The process of globalization in science manifests in various forms, from collaborative publications to large-scale joint scientific projects. The number and diversity of communication channels in the scientific field are increasing, particularly with the active integration of online communication. This expansion of opportunities for scientific collaboration not only extends the influence of established scientific centers but also offers new scientific institutions greater opportunities to gain recognition (Gui et al., 2019).
Academic literature also emphasizes the new perspective on scientific translation issues in light of technological progress. A topic of current interest is the reciprocal influence between translation practice and scientific development. While translation serves as a tool for disseminating scientific knowledge, advancements in translation technology enhance this tool. Thus, translation and science follow the same path, expanding and enriching scientific and general communication (Olohan, 2016).
A significant aspect of contemporary scientific translation is its role in increasing university autonomy, expanding academic freedom, opening access to scientific developments, and creating opportunities for discussing and disseminating ideas (Zehner & Duran Del Fierro, 2026). Additionally, the complexity of modern scientific research, including all areas of linguistics, often requires an interdisciplinary approach to translation (Eigi-Watkin et al., 2024).
Contemporary research explores scientific translation from a wide range of perspectives. The interdisciplinary connection between translation and philosophy is continuously expanding, taking on new forms. Studies at the intersection of philosophy and translation address issues such as language and cultural hierarchy. Scholars

frequently examine the challenges associated with the growing use of new technologies, including machine translation, and the impact of translation on pedagogy and knowledge transfer (Leal & Wilson, 2023). This study aims to advance this literature by analyzing the relationship between philosophical issues in translation and practical challenges in scientific knowledge acquisition in the twenty-first century.

Problem Statement

Translation is one of the most crucial domains facilitating communication in society. In scientific knowledge, which confronts an increasing number of challenges requiring collective efforts, including joint scientific development, translation occupies a unique position. Advancements in technology are expanding the possibilities for conveying information, potentially eliminating the intermediary role of the translator in communication. Scientific translation remains a vital aspect of communication that extends beyond mere recoding of information and encompasses legal and ethical considerations. Consequently, the application of fundamental philosophical and ethical mechanisms is essential.

This study aims to evaluate the philosophical aspects of scientific translation through the lens of global practical challenges that emerged in the twenty-first century.

To achieve this objective, the following tasks were outlined:

1. To examine the current state of translation with regard to scientific developments and language hierarchy in science.
2. To define the term “translation” and identify the characteristics that distinguish scientific translation from other types of translation.
3. To analyze relevant international and local regulations governing translation to identify issues concerning the rights of researchers and translators and adherence to ethical standards in science and translation.
4. To investigate the challenges associated with the use of machine translation and artificial intelligence (AI) in scientific knowledge exchange.

Methods and Materials

This study assessed the current demand for scientific translation and examined the philosophical problems associated with translation in scientific inquiry. The first stage of this research focused on examining the current state of translation in light of scientific developments and language hierarchy in science. The influence of globalization on the emergence of new philosophical issues in translation was also evaluated. Trends in globalization for the 2020s were assessed to determine the feasibility of communication without translation among the 50 leading countries, using statistical data from Statista (2025). Countries classified by region or income level (Europe and Central Asia; high income) were excluded. Furthermore, the assessment did not consider the "frequent use" criterion, particularly for English, given the focus on translation.

To confirm the significance of scientific translation for contemporary society, global economic development, and knowledge exchange, statistical data from the World Intellectual Property Organization (2023) were utilized. These data demonstrated a consistent increase in the number of applications in the two most research-intensive fields: patent and utility model registrations. The importance of scientific translation in modern scientific development is further supported by UNESCO data on international cooperation in scientific research (UNESCO, 2024). Additionally, key provisions of the 2021 UNESCO Recommendations on Open Science (UNESCO, 2023) were analyzed in the context of globalization.

The second stage of the research involved defining the concept of translation and identifying the specific characteristics of scientific translation from the perspective of philosophical categories. Based on the definition provided in the Translator’s Charter (Tradulex, 1963), the unique aspects of scientific translation were delineated. Examples

from UNESCO (Dall, 2022) were examined to identify issues related to the scientific translation of research results from indigenous peoples.
The third stage, presented in the section titled "Cognitive Load and Comprehension in Scientific Translation: A Comparative Study", constituted an experiment. This stage evaluated how various translation strategies influence the reader's cognitive load and the comprehension of a text by recipients with differing levels of prior knowledge of the content. An excerpt from the article "Characterisation of cadmium-responsive MicroRNAs and their target genes in maize (Zea mays) roots" (Gao et al., 2019) published in BMC Molecular Biology was selected as the experimental material. The selected passage contained specialized terminology and was an excerpt from a study in the field of biology. Four translation variants were prepared for the experiment: 1) a literal translation produced by a professional translator (P(l)); 2) an adapted translation produced by a professional translator, in which specialized terminology was replaced with more accessible equivalents and grammatical structures were simplified (P(a)); 3) a literal translation generated by artificial intelligence (AI(l)); 4) an adapted translation generated by artificial intelligence using the same adaptation parameters (AI(a)). The experiment involved two focus groups (biologists and participants without a background in biology) of 15 people each. Participants were asked to read text fragments. During reading, cognitive load indicators (eye tracking and heart rate) were recorded. The data obtained was used to assess differences in cognitive load depending on the translation variant and the composition of the focus groups. After reading, participants were tested to determine their level of text comprehension.

Results

Scientific Knowledge and Translation in the Twenty-First Century: The Role of Scientific Translation in the Process of Knowledge Acquisition and Dissemination

Globalization is a decisive factor that shapes both the practice and theory of translation, leading to new philosophical challenges. Prior to addressing them, it is crucial to examine the current state of globalization and its impact on the development and exchange of scientific knowledge. Translation, despite its importance, remains an auxiliary tool within this framework.
The present study employs the Globalization Index as a measure of globalization processes within a given country. This index encompasses three primary domains: economic, social, and political. Globalization is defined as the development of connections between entities across continental divides, with various "exchange flows" such as the exchange of information and ideas. The primary outcome of globalization is a new space that is independent of limitations imposed by national borders, cultural boundaries, and differences in economic development. As of 2023, 48 countries worldwide lead in globalization (Statista, 2025). Table 1 shows the correlation between the top globalization countries and their official languages.

Table 1: Languages Officially Recognized by Two or More Countries among the Top 50 Globalization Leaders

Official language	Country
French	Switzerland; Belgium; France; Luxembourg; Canada
German	Switzerland; Belgium; Germany; Austria; Luxembourg
Italian	Switzerland; Italy
Dutch	Belgium; Netherlands
English (de facto or officially)	United Kingdom; Ireland; Canada; Singapore; United States; Australia; Malta; New Zealand
Swedish	Sweden ; Finland

Spanish	Spain; Chile; Mexico; Uruguay
Slovak	Czech Republic; Slovak Republic
Greek	Greece; Cyprus
Arabic	United Arab Emirates; Qatar; Jordan

Source: Compiled by the author based on data from Statista (2025).

Based on these data, preliminary conclusions can be drawn regarding the need for translation, even assuming that a portion of a country's population is proficient in one or more foreign languages. This need is particularly evident in contexts involving official documents or specialized terminology. Figure 1 illustrates this demand, with a focus on countries with two or more official languages.

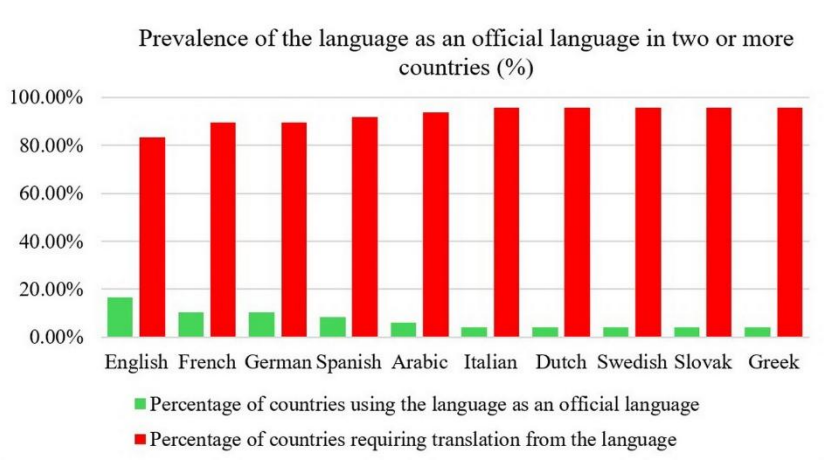


Figure 1: Possibility of Communication without Translation Assistance (Considering Official Languages) among the 50 Leading Countries in the World (Based on the Globalization Index)
Source: developed by the author based on data from Statista (2025).

The role of collaboration in scientific development is further supported by data on intellectual property registrations. For instance, according to the World Intellectual Property Organization (WIPO), the number of active patents increased from 10,224,800 to 17,250,800 over a decade (starting from 2013), while utility models rose from 2,300,100 to 11,125,700 (World Intellectual Property Organization, 2023). This represents a 68.72% increase in patent applications and a 383.71% increase in utility models over the past ten years, indicating a significant demand for translation services in this field.

The importance of scientific collaboration, and consequently scientific translation, continues to grow. As a leader in international science and education exchange, UNESCO emphasizes the need to continue a scientific approach based on the principle of "One Earth." This principle assumes that no single country can independently address the scientific challenges facing humanity today (UNESCO, 2024).

In 2021, UNESCO adopted the Recommendations on Open Science. Beyond general objectives related to providing scientific knowledge to society, this instrument aims to ensure equal access to knowledge in light of the multilingual nature of the modern world. The recommendations outline the values and principles of scientific knowledge, particularly emphasizing that the principle of open science aligns with the right to benefit from scientific progress as enshrined in the Universal Declaration of Human Rights (UNESCO, 2023). In the context of globalization and the pressing need for

international scientific collaboration to address global issues, effective communication within the international scientific community is crucial. This encompasses not only the accuracy of translation but also adherence to ethical standards.

The Concept of Translation and Distinctive Features of Scientific Translation

Adopted in 1963, The Translator's Charter defined translation as a form of intellectual activity aimed at transferring various types of texts (including scientific texts) into a language different from the one in which the texts were originally created (Tradulex, 1963). At first glance, this may seem to involve simple recoding. Nonetheless, translation should be understood as a multifaceted phenomenon, particularly in the field of scientific knowledge. Translation itself is a cognitive process, as it involves an in-depth analysis of meaning to most accurately and completely convey it. This practice can be characterized as the internal aspect of cognitive activity in translation.

The second stage of scientific translation involves recoding the text, making its content accessible to the recipient and facilitating the transmission and dissemination of scientific knowledge. This aspect can be described as the external manifestation of translation. At this stage, the translator becomes an active participant in the communication process, as contemporary scientific translation requires not only strict lexical but also cultural recoding. This is particularly relevant for certain groups of countries where specific scientific concepts lack equivalents. According to UNESCO data, in many African countries, researchers lack specialized terms to describe certain phenomena. The problem remains a serious challenge for many indigenous peoples (Dall, 2022), forcing the translator to search for a universal scientific equivalent. This situation can also be viewed through the lens of decolonization and a return to national identity, which has become a distinctive feature of contemporary scientific translation.

When discussing translation within scientific knowledge, it is essential to recognize that translation is not limited to interlingual translation, which is based on linguistic substitution. It also encompasses intralingual translation, where recoding occurs within the same language, and semiotic translation, defined as recoding through a system of symbols (Ranganathan, 2007). Translation can be understood both in a narrow sense, typically referring to interlingual translation, and in a broader sense, encompassing any form of recoding aimed at conveying information. Scientific translation extends beyond the mere transfer of information "from one code to another." This process requires careful consideration of additional factors, and the accuracy of meaning takes precedence over the literal transfer of wording.

Protection of the Rights of Researchers and Translators and Ensuring Adherence to Ethical Standards in Science and Translation

The Translator's Charter asserts that a translator should aim to enhance mutual understanding, facilitate communication between nations, and contribute to improving the quality of life. Accurately transmitting the meaning and form of the translated information is a direct responsibility of the translator; however, this does not imply a requirement for literalness. In scientific translation, in addition to a profound command of the target language, the translator must possess deep knowledge in the subject area. This means that translators must decline assignments in fields where they lack expertise (Tradulex, 1963).

The official requirements for the selection of judges for the Unified Patent Court (UPC) may serve as an illustrative example of scientific translation. This example does not pertain directly to translation but rather to the integration of cognitive and translational functions within modern scientific inquiry. A candidate for the UPC judiciary is required to demonstrate both professional and linguistic competencies necessary for managing tasks that demand a deep understanding of multiple domains. The international status of the court necessitates advanced linguistic skills beyond legal and

technical expertise in patent litigation (Unified Patent Court, 2024). This comprehensive approach to tasks involving both content evaluation and language knowledge ensures competent and objective handling of cases in the highly specialized field of patent disputes.

Another crucial aspect is copyright legislation, which allows authors of scientific materials to directly influence the decisions of translators. The relevant provisions are outlined in the Berne Convention for the Protection of Literary and Artistic Works (World Intellectual Property Organization, 1886). This instrument provides several legal frameworks aimed at safeguarding not only legal but also ethical considerations that may arise during translation, including for scientific works.

Article 6bis, paragraph 1 of the Convention stipulates that the author, regardless of whether they have transferred economic rights over the work, retains the right to oppose modifications to the work that may harm their honor and reputation. It is undeniable that translation errors in scientific works can have significant negative consequences for the author's reputation. Consequently, the author has a direct stake in the competencies of the translator. Article 8 of the Convention addresses this problem by granting the author the exclusive right to authorize or prohibit the translation of their work. Thus, the author has the opportunity to negotiate terms regarding the translator's identity and qualifications.

While the translation of literary works may prioritize the translator's ability to capture linguistic artistry and social contexts, scientific translation requires a profound understanding of the scientific issue at hand. An ethical approach to scientific work is reflected in the opportunities provided to researchers to influence who undertakes the translation. This has significant implications for the accuracy of scientific knowledge transfer and the researcher's reputation.

While research can both positively and negatively impact societal life, it is subject to a range of constraints. For instance, the scope of studies involving human participants and the use of artificial intelligence may be restricted or specifically regulated by the rules of the scientific community (World Health Organization, 2024). Accordingly, the translator's familiarity with and understanding of the source text is decisive. No legal norms obligate the translator to make informed judgments regarding adherence to or violations of scientific ethics in the provided text. However, the translator's assessment and attitude towards its content carry significant ethical weight at the initial stage of familiarization. According to Paragraph 3 of Section I of The Translator's Charter, translators are not required to participate in translating texts that contradict their moral and ethical beliefs (Tradulex, 1963). Thus, a translator may refuse to translate a text not only if there are doubts about research ethics but also based on personal reasons.

At the initial stage of translating a scientific text, the translator performs a linguistic assessment of its vocabulary and terminology. The text is then evaluated in terms of its compatibility with the translator's minimal personal competence in its scientific content. Finally, the field, methods, and directions described in the text must align with the translator's personal moral and ethical standards.

Cognitive Load and Comprehension in Scientific Translation: A Comparative Study.

The study revealed the factors influencing the perception of the text: the reader's level of professional training and the translator's use of text adaptation strategies (replacing specialized terminology with synonyms, simplifying grammatical structures). Translations produced by professional translators and those generated by artificial intelligence were perceived differently (Figures 2 and 3).

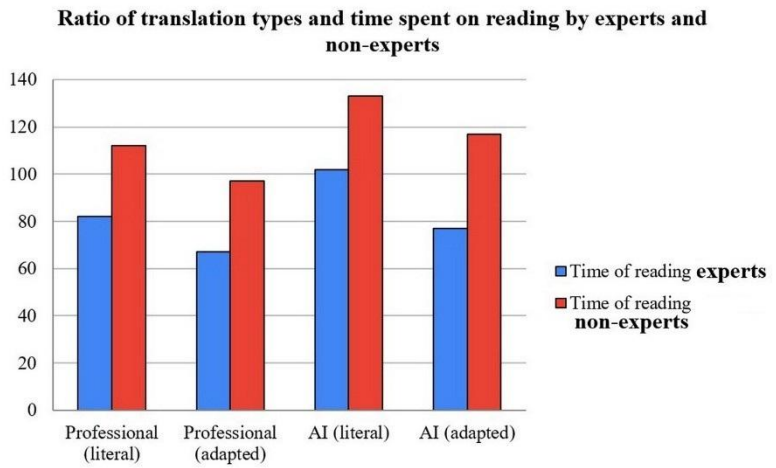


Figure 2: Time Spent Reading and Translation Types: Biology Specialists Versus Participants Without Specialized Knowledge
Source: developed by the author based on experimental data

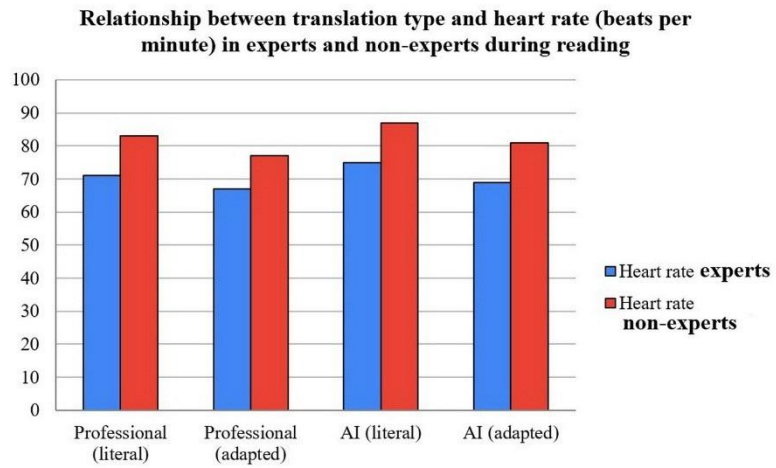


Figure 3: Heart Rate During Reading and Translation Types: Biology Specialists Versus Participants Without Specialized Knowledge
Source: developed by the author based on experimental data

For all types of translation, expert participants demonstrated faster information perception with lower resource consumption. Literal translation performed by artificial intelligence required the most time and cognitive effort from participants in both focus groups, regardless of whether the translation was literal or adapted. Adapted translation performed by a professional translator reduced both of these indicators. Regarding text comprehension, the gap between literal and adapted translations among participants without specialized education differed significantly from that observed among expert participants. Comprehension also varied depending on whether the translation was literal or adapted and on the method of its execution (Figure 4).

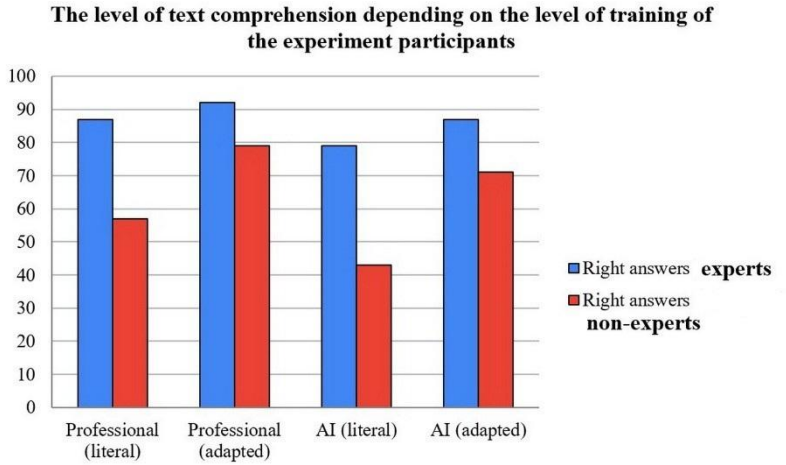


Figure 4: Text Comprehension and Translation Types: Biology Specialists Versus Participants Without Specialized Knowledge
Source: developed by the author based on experimental data

The level of text comprehension among participants with specialized education was higher and did not vary significantly depending on the type of translation. Meanwhile, this variation was significant for non-expert participants (Figure 5).

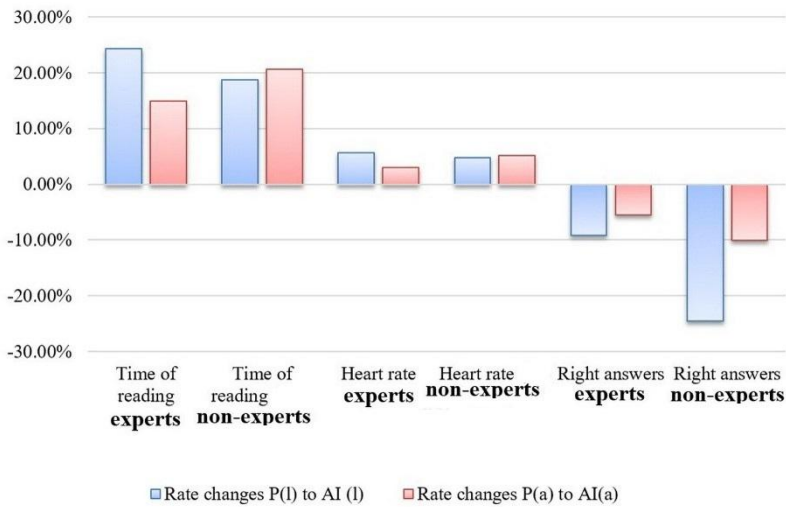


Figure 5: Change in indicators when replacing a professional translation (P(l), P(a)) with an AI translation (AI(l), AI(a)), in percentage terms; l = literal, a = adapted.
Source: developed by the author based on experimental data

The results demonstrate that specialized knowledge significantly affects cognitive load and comprehension. The time spent reading literal and adapted translations differed significantly for experts, whereas for non-experts, the difference is insignificant. The higher time consumption among experts can be attributed to the fact that literal versions required them to simultaneously analyze information and data; this information

provided no additional value for participants without such training. In contrast to modest differences in heart rate, text comprehension indicators exhibited significant variations. Among experts, comprehension of AI translation showed an error rate of approximately 10% for the literal version and 5% for the adapted version. Among non-experts, the error rate rose sharply and reached approximately 25% for the literal version and 10% for the adapted version.

Discussion

The relative novelty of translation philosophy as a distinct field, both within philosophy and linguistics, gives rise to numerous questions. Scholarly opinion either diverges or has yet to be subjected to serious discussion. Fayemi (2010) argues that cultural differences, specific modes of thinking, and communication processes can significantly complicate intercultural communication, a conclusion also reflected in other studies. Language, as the primary means of expressing these differences, serves, in a certain sense, as a tool of division rather than a means of unification. The present study shows that this conceptualization primarily pertains to issues of national identity. In scientific knowledge, language, including the language of translation, tends to have a unifying role, as it facilitates progress toward a common goal despite disagreements over various theories.

Heller and Payne (2019) highlight the need for developing specialized glossaries in scientific translation, emphasizing that this process reflects the translators' creativity. This perspective is well-founded, as research has shown that translating scientific texts involves more than mere recoding; it necessitates a deep understanding of the original text and its underlying ideas. Such understanding enables translators to ensure comprehension even for individuals without specialized knowledge. When participants in the present experiment were asked to read machine translations, their comprehension diminished significantly. Post-editing, as a special type of translation, not only improves results and increases comprehension, but also constitutes a form of interaction between the machine and the translator (Peng et al., 2024).

The philosophy of scientific translation raises broader questions about scientific knowledge. For instance, the question of whether science can be considered an unequivocal public good remains a significant philosophical issue. Radder (2017) discusses the general nature of knowledge. Dormandy and Grimley (2024) further explore issues related to the quality and scientific value of certain concepts, as well as the prevalence of pseudoscientific ideas. Resnik and Elliott (2023) call for the need for philosophical criteria that distinguish between scientific and non-scientific results. The discourse may extend to the ethical evaluation of translators' roles in disseminating knowledge that may not serve public interests. While this study does not address this issue, it remains relevant and could serve as a foundation for future research in the philosophy of scientific translation.

Scientific translation, as a tool of knowledge, encounters challenges concerning authenticity and scientific value. These ethical issues indicate that the philosophy of scientific translation cannot be considered in isolation from the philosophy of science as a whole. For instance, the study by de Paz and Gori (2023) examined the application of philosophical methods to various scientific domains, including both new and classical approaches. Their findings underscore the importance of integrating philosophical perspectives into scientific inquiry.

In this context, attention to the philosophy of science necessitates examining the philosophy of translation across different contexts. First, the applicability of general scientific methodology to the philosophy of translation is significant, as the latter has evolved to a level where it can be viewed as a field bridging both philosophy and linguistics. Second, translation, as a tool for rendering information into an accessible

form, also serves as a means for shaping scientific methodology. This thesis could provide a foundation for further in-depth exploration of translation philosophy.
From a technological perspective, in particular the contrast between machine translation (AI-generated) and human translation, the level of comprehension depends on several factors. In this study, the understanding of complex scientific texts differed considerably between experts and non-experts. Studies in which participants used texts corresponding to their knowledge level showed no significant differences in the comprehension of the two types of translation (Maghsoudi & Mirzaeian, 2020). However, even with sufficiently advanced machine translation, the role of the translator remains predominant (Zouhar et al., 2021). Despite its growing quality, AI translation cannot eliminate the need for post-editing by the translator (Siu, 2023). The critical approach to translations generated by artificial intelligence also remains a relevant concern (Belhassen, 2025), especially regarding complex scientific texts.

Conclusions

In the era of globalization, translation serves as a crucial tool for communication and the dissemination of scientific knowledge. The advancement of cutting-edge technologies, which facilitates communication, has successfully overcome spatial barriers, including those in international scientific dialogue. However, statistics indicate that communication-related challenges persist within the scientific community, demanding not only extensive knowledge of terminology but also a profound understanding of the subject matter. Data show that linguistic communication is dominated by a limited number of languages, which may restrict the participation of researchers who lack sufficient proficiency in those languages. Simultaneously, globalization is accompanied by efforts to promote open science, necessitating further advancement of scientific translation from both linguistic and philosophical perspectives.
In its core purpose – transmitting information through another language – scientific translation is similar to any other translation. Nevertheless, it is a distinct form of cognitive activity aimed at a comprehensive understanding of the source text from lexical and scientific perspectives. A specific feature of scientific translation is the focus on the accuracy of meaning, as content holds paramount importance over form in scientific inquiry. The practice of scientific translation requires dual competence: the ability to ensure precision in translation and consciously adhere to ethical standards, including those of the scientific community. Since modern science restricts or prohibits research in certain areas, the translator's competence must be sufficient to assess the scientific ethics of the text. Moreover, the refusal to perform a translation on ethical grounds is an inherent right of the translator.
Both scientific and translation activities are evolving due to globalization and rapid technological advancement. The availability of technological tools facilitates one of the translator's key tasks: the lexical analysis of scientific texts. However, research advancements, including ideas on the edge of ethical norms, necessitate that scientific translators possess a profound understanding of scientific ethics and the acceptability of research methods. Philosophical and, primarily, ethical issues are central concerns in scientific translation. Additionally, the use of artificial intelligence in translation remains a pertinent issue. While professionally adapted translations can ensure a high level of text comprehension, machine translation, even when adapted, significantly reduces comprehension rates and requires considerable cognitive effort.
The effectiveness of an AI or human translation depends on a wide range of factors that, in different combinations, can influence the results. These include the audience's level of preparation, the complexity of the text, and whether the translation is literal or adapted. From the perspective of the balance between accuracy and ease of understanding, adapted translation is more effective. It reduces the cognitive load regardless of the reader's level of knowledge but can lead to a loss of accuracy in

complex scientific texts. Despite constant improvements and financial benefits, AI-generated translations still contain errors that require monitoring by professional translators, especially when interpreting complex scientific texts. Consequently, AI use can only be justified in situations where the user has sufficient knowledge to critically evaluate the information received.

The findings confirm the need for deeper training of translators in the field of scientific translation across two key areas. The first area encompasses parallel expertise in both translation and a specific field of knowledge, as well as a broad understanding of scientific research ethics. The second area is the ability to professionally utilize AI, which, as the study indicates, should follow a three-stage procedure: familiarization with the text and assessment of its ethics and the translator's qualifications; the translation process itself; and evaluation of the final output in terms of accuracy and cultural context. Developing specific methodological recommendations on these issues could serve as a basis for future research.

Declaration of AI Use

The authors declare that no artificial intelligence (AI) tools were used at the stage of writing, research, and data analysis process. All research design, analysis, interpretation, and conclusions are the result of the authors' own intellectual work. With that, the authors declare the use of OpenAI's ChatGPT (GPT-5.5) to assist with improving the readability and stylistic refinement of the text. All sources are properly cited.

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