# Rage against the AI machine? Perspectives and attitudes of Spanish scholars outside the language services sector regarding neural machine translation, chatbots, and post-editing

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## Abstract

Through a combination of quantitative and qualitative analysis, this article presents the findings of the questionnaire developed for the GAMETRAPP project, with a focus on capturing the perspectives and attitudes of 182 Spanish scholars outside the language services sector regarding neural machine translation, chatbots and post-editing.

**Keywords**: post-editing, neural machine translation, chatbots, scholarly communication, questionnaire.

## Resumen

Mediante una combinación de análisis cuantitativo y cualitativo, este artículo presenta los resultados del cuestionario elaborado para el proyecto GAMETRAPP, con el objetivo de recoger las perspectivas y actitudes de 182 académicos españoles fuera del sector de los servicios lingüísticos respecto a la traducción automática neuronal, los chatbots y la posedición.

**Palabras clave**: posedición, traducción automática neuronal, *chatbots*, comunicación académica, cuestionario.

## Resum

Mitjançant una combinació d'anàlisi quantitativa i qualitativa, aquest article presenta els resultats del qüestionari elaborat per al projecte GAMETRAPP, amb l'objectiu de recollir les perspectives i actituds de 182 acadèmics espanyols fora del sector dels serveis lingüístics envers la traducció automàtica neuronal, els xatbots i la postedició.

**Paraules clau**: postedició, traducció automàtica neuronal, xatbots, comunicació acadèmica, qüestionari.

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## 1. Introduction

Technology, especially artificial intelligence (AI), plays a pivotal role in shaping contemporary life, powering a wide range of innovations across different sectors (Zhang et al., 2021). In the field of translation, technological progress has been propelled by breakthroughs such as neural machine translation (NMT) (Sánchez Ramos & Rico Pérez, 2020) and the emergence of large pre-trained language models (LLMs) (Brown et al., 2020). These AI-driven advancements have given rise to a new generation of translation and language tools, including real-time translation systems and interactive conversational agents and chatbots like ChatGPT (OpenAI, 2022; Jiang & Zhan, 2024; Rivas Ginel & Moorkens, 2024).

Although, as stated by Cadwell et al. (2017), the language industry was resistant to adopting machine translation (MT), more recent studies, such as that by Moorkens & Guerberof-Arenas (2024), highlight the growing integration of AI. In this context, recent surveys, such as Nimdzi's 2025 report (Nimdzi, 2025), indicate that 68% of language service providers (LSPs) use generic out-of-the-box LLM solutions like ChatGPT, Claude.ai, Gemini, Copilot, etc.

While NMT and LLMs are very important in the language services industry, their influence extends far beyond, becoming integral to a broad spectrum of professional, interpersonal, and social interactions worldwide. One of the main drivers behind the growing demand for NMT and LLMs is the increasingly multilingual nature of society, which requires efficient communication across a variety of languages. However, this multilingualism often conflicts with the rising dominance of English as the common language in research and international academic publishing (Curry & Lillis, 2019). The widespread use of English, along with the global rise of the "publish or perish" mentality in academia, is pushing scholars from both English-speaking and non-English-speaking countries to publish their work in English. Scholars from non-English-speaking backgrounds are now often referred to as English as an Additional Language (EAL) scholars, particularly in the context of English for Research Publication Purposes (Flowerdew & Habibie, 2022; Zou et al., 2023).

The disparities caused by the dominance of English in academic publishing are becoming increasingly apparent across various fields (Bowker, 2024). For example, Amano et al. (2023) found that non-native English speakers invest significantly more time, effort, and resources in reading and writing academic articles in English. To address the challenges of publishing in English, and given the improving quality of NMT output, many scholars are turning to MT, whether via NMT, LLMs, or chatbots, to write and translate their papers. In the case of chatbots, medical articles and medical writing have thus far been the primary beneficiaries of their use (Ashraf & Ashfaq, 2023; Biswas, 2023; Kitamura, 2023), although recent studies have also examined their application in scholarly and scientific communication more broadly (Pollesello & Paap, 2023; Salvagno et al., 2023; Li et al., 2024).

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While the accuracy of translation technology based on AI has been significantly improved (Yuxiu, 2024; Toledo-Báez, 2024), it is still widely acknowledged that MT output often requires post-editing (PE) to meet publishable standards. According to ISO 18587:2017, PE is defined as the "editing and correcting of machine translation output." The combination of NMT and PE in scholarly communication has already been explored in several studies. For instance, Goulet et al. (2017) investigated the use of NMT to assist in composing academic texts in EAL with a group of ten scholars. Similarly, Parra Escartín et al. (2017) conducted a survey on the use of NMT by medical professionals, analysing their post-edits and evaluating end-product quality with the help of a professional proofreader. Other research, such as studies by O'Brien et al. (2018) and Parra Escartín & Goulet (2020), has also explored the relationship between NMT and PE, focusing on the quality and characteristics of the results of PE.

In the context of scientific communication in EAL and the use of NMT and PE, the "Training app for post-editing neural machine translation using gamification in professional settings (GAMETRAPP)"[1] project (Toledo-Báez & Noriega-Santiáñez, 2024; Toledo-Báez & Marín-Navarro, 2025a and 2025b) has developed "GAMETRAPP: escapa de Poseditón"[2], a serious videogame — specifically a virtual escape room — to introduce and promote the PE of research abstracts machine-translated from Iberian Spanish to American English (L1 to EAL). While other applications, such as Kaninjo (Moorkens et al., 2016), have been designed to train users in PE, the GAMETRAPP project is unique in its use of gamification as an innovative approach to engage users in the PE-learning process. A crucial aspect of designing both a gamified environment and a web application is understanding user needs and motivation (Herzig et al., 2015). Given that the target users of the GAMETRAPP platform are Spanish scholars, a questionnaire was developed and distributed to gather information on the methods used by scholars in Spain when drafting and translating abstracts for their scientific publications.

In participant-oriented research, the term "survey" is typically used to describe the overall study design, while "questionnaire" refers to the tool used to collect data (Saldanha & O'Brien, 2014). Numerous surveys have already been conducted and questionnaires administered to examine the use of NMT and/or PE among professional translators (see Gaspari et al., 2015; Moorkens & O'Brien, 2017; Álvarez-Vidal et al., 2020; Canavese & Cadwell, 2024; Toledo-Báez, 2024, among others), as well as among translation students in particular (González Pastor, 2021) and students of the humanities more broadly (Bowker, 2020; Dorst et al., 2022). However, aside from the study by Parra Escartín et al. (2017), there is a notable gap in surveys and questionnaires examining the use of NMT and/or PE by non-translators or non-linguists. While a few examples exist, none specifically focus on scholarly communication. For instance, Anazawa et al.

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(2013) examined how Japanese nursing professionals used MT to access information from international journals. Their findings revealed that over half of the participants considered MT to be useful, with the study concluding that language proficiency plays a crucial role in the effective use of MT. Another relevant study by Nurminen (2020) interviewed nine Scandinavian patent professionals about their use of raw NMT output in their work, finding that NMT was both widely adopted and used over the long term.

This article presents the methodology behind and findings of the questionnaire developed for the GAMETRAPP project, with a focus on capturing the perspectives and attitudes of Spanish scholars regarding NMT and PE. To ensure a participant pool outside the language services sector (LSS), scholars from linguistic disciplines were not included, as they may have had connections to or experience within the language industry. To explore potential similarities and differences across fields, participants from non-linguistic disciplines were categorised into five main academic areas: Social Sciences, Engineering and Architecture, Natural Sciences, Health Sciences, and Arts and Humanities.

This article integrates both quantitative and qualitative analyses, utilising descriptive statistics, the Kruskal–Wallis test or Mann–Whitney U test for significance, Spearman's correlation, and sentiment analysis. The paper is organised into three main sections: Section 2 outlines the methodology, Section 3 presents the results, and Section 4 discusses the main conclusions.

## 2. Methodology

### 2.1. Research questions and data analysis

In light of the aim of developing a serious videogame and a web application to introduce and promote the PE of research abstracts among Spanish scholars, this study addresses the following three research questions (RQs):

RQ1: How prevalent is the use of NMT and chatbots among Spanish scholars outside the LSS for drafting and translating abstracts in/into English?

RQ2: What level of familiarity do Spanish scholars outside the LSS have with PE?

RQ3: To what extent do Spanish scholars outside the LSS perceive an application for training in post-editing research abstracts translated from Spanish into English as useful?

RQ1 and RQ2 were intended to evidence the current situation for Spanish scholars outside the LSS. RQ3 sought to provide valuable insights into the potential usefulness of an app designed for PE training.

To address these three RQs, both quantitative and qualitative analyses were conducted. Quantitative analysis involved the use of descriptive statistics, the Kruskal–Wallis test or the Mann–Whitney U test for significance, and Spearman's rank-order correlation. A Kolmogorov–Smirnov test indicated a significant deviation from normality

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($p < 0.05$), which justified the use of non-parametric tests for further analysis. Specifically, the Kruskal–Wallis test was applied for comparisons involving three or more groups, and the Mann–Whitney U test was used for comparisons between two groups, both conducted using IBM SPSS to assess statistically significant differences across academic disciplines. Statistical significance was set at a threshold of $p < 0.05$. Additionally, Spearman's rank-order correlation was employed to examine relationships among key variables, including gender, age, professional category, years of research experience, and academic discipline. As with the other analyses, correlations were considered statistically significant at $p < 0.05$.

Qualitative analysis involved a sentiment analysis of responses to the open-ended question included in the questionnaire, conducted using Atlas.ti software.

## 2.2. Instrument

The main instrument of this study is a questionnaire developed using Google Forms. It underwent a two-phase validation process. First, it was reviewed by five experts (three Translation Studies scholars and two Statistical Sciences scholars). Second, it was approved by the Ethics Committee for Experimentation of the University of Málaga. The questionnaire, administered in Spanish,[3] was distributed to scholars from both public and private universities across Spain. It was launched in mid-September 2024 and remained open until the end of January 2025. To maximise participation, the survey was shared through professional networks, LinkedIn, and academic mailing lists.

The questionnaire was divided into two sections. Section 1 included all demographic data, obtained through nine closed-ended questions covering:

a) information about the participant (gender, age, professional category, years of research experience, etc.)
b) areas of scientific production
c) mother tongue(s) and foreign/additional languages
d) self-reported English proficiency level.

Section 2 examined the methodology used by Spanish scholars when writing and/or translating the abstracts of their scientific publications. The questionnaire consisted of 18 questions (17 closed-ended and one open-ended). The information collected relates to:

a) frequency of publication in English and Spanish
b) frequency of requests for an abstract in English
c) perceived ease of writing in and/or translating into English
d) use and perception of language technologies (NMT tools, online dictionaries, chatbots, etc.) for drafting and translating abstracts in/into English
e) use of external professional translation and/or PE services
f) familiarity with and use of PE
g) perceived value of an app for training in the PE of Spanish-to-English abstracts
h) an open-ended item for additional comments on the questionnaire or anything related to NMT or PE that the respondent felt was relevant.

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[3] Access to the English version of the questionnaire: <https://forms.gle/Z4bGj1HFqPdujVj49>

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## 2.3. Participants

A total of 253 responses were collected from scholars representing 42 institutions, encompassing both public and private universities in Spain. Notably, 41 of these institutions were public universities, accounting for approximately 98% of all public universities in the country, which contributes to a high degree of representativeness.

For the final analysis, a two-stage participant selection process was applied. In the first stage, only respondents who self-reported having an English proficiency level of B2, C1, or C2 according to the Common European Framework of Reference for Languages (CEFR) were included ($n$ = 221), as these levels reflect advanced to proficient language skills. In the second stage, 39 participants from linguistic disciplines, specifically the fields of translation and languages, were excluded due to their potential ties to the LSS.

This resulted in a final sample of 182 participants from non-linguistic disciplines, who were then grouped into five major academic areas — Social Sciences, Engineering and Architecture, Natural Sciences, Health Sciences, and Arts and Humanities — to facilitate the exploration of potential similarities and differences across fields.

Regarding demographic information about the 182 participants, 57.1% ($n$ = 104) were male and 42.9% were female ($n$ = 78). The participants' ages ranged from 23 to 66 years old (mean age = 43.60 years, standard deviation, SD = 9.42); the most numerous group corresponded to the age range of 41–50 (41.8%, $n$ = 76), followed by 31–40 (23.6%, $n$ = 43), 51–60 (20.9%, $n$ = 38), 21–30 (11.5%, $n$ = 21), and 61–70 (2.2%, $n$ = 4). The participants' research experience ranged from 0 to 40 years (mean = 15.69 years, SD = 8.57); the most numerous group corresponded to the time range of 11-20 years (43.4%, $n$ = 79), followed by 0–10 years (29.7%, $n$ = 54), 21–30 years (21.4%, $n$ = 39), and 31–40 years (5.5%, $n$ = 10).

With respect to professional category, just over half of the scholars identified as 'Associate Professor' (51.6%, $n$ = 94). The remaining respondents were distributed across various other academic and research roles: 'Postdoctoral Fellow' (11%, $n$ = 20), 'Assistant Professor' (10.4%, $n$ = 19), 'Lecturer' (8.8%, $n$ = 16), 'Predoctoral Fellow' (8.8%, $n$ = 16), 'Adjunct Lecturer' (4.9%, $n$ = 9), 'Temporary Lecturer' (2.2%, $n$ = 4), 'Other (laboratory technicians, researchers in corporations)' (1.6%, $n$ = 3), and 'Visiting Professor/Lecturer' (0.5%, $n$ = 1).

In terms of academic disciplines, the largest group of scholars fell into the category of Social Sciences (32.4%, $n$ = 59), followed by Engineering and Architecture (28.6%, $n$ = 52), Natural Sciences (18.1%, $n$ = 33), and Health Sciences (17.6%, $n$ = 32). Given that, as explained above, 39 participants from linguistic disciplines were excluded, Arts and Humanities represented the smallest proportion, accounting for just 3.3% of the total ($n$ = 6).

Concerning native languages, Spanish was the most common (88.1%, $n$ = 160), followed by co-official languages of Spain such as Catalan (8.4%, $n$ = 15). Other native languages included French (1.5%, $n$ = 3), Portuguese (1.5%, $n$ = 3), and English (0.5%, $n$ = 1). As for foreign and/or additional languages, the most common were English

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(71.9%, $n$ = 130), French (10.2%, $n$ = 19), and Italian (9.4%, $n$ = 17). German (4.5%, $n$ = 8), Portuguese (3.3%, $n$ = 6), Japanese (0.4%, $n$ = 1), and Swedish (0.4%, $n$ = 1) were reported by smaller percentages of respondents.

## 3. Results

The results will focus on the most relevant questions from the questionnaire, specifically: the frequency of requests for abstracts in English for articles written in Spanish, the perception and use of NMT and chatbots for drafting and translating abstracts in/into English, familiarity with and use of PE, and the perceived usefulness of a training app designed to support the PE of research abstracts translated from Spanish into English.

### 3.1. Frequency of requests for abstracts in English for articles written in Spanish

The analysis of the frequency of requests for abstracts in English for articles written in Spanish reveals considerable variation across academic disciplines, as illustrated in Figure 1. In Social Sciences, 47.5% ($n$ = 28) of scholars reported that they 'Always' provide an abstract in English, while 32.2% ($n$ = 19) said they 'Usually' do so. This indicates that nearly 80% regularly provide English abstracts. In Health Sciences, 43.8% ($n$ = 14) 'Always' provide an English abstract and 15.6% ($n$ = 5) 'Usually' do, whereas 21.9% ($n$ = 7) chose 'I do not publish in Spanish', underscoring a strong international orientation. In Natural Sciences, only 6.1% ($n$ = 2) 'Always' include an English abstract, while 33.3% ($n$ = 11) 'Usually' do and 24.2% ($n$ = 8) 'Sometimes' do. Notably, 36.4% ($n$ = 12) do not publish in Spanish, indicating that English is often their primary language for reaching international audiences.

In Engineering and Architecture, responses were more evenly distributed: 21.2% ($n$ = 11) 'Always', 23.1% ($n$ = 12) 'Usually', and 25% ($n$ = 13) 'Sometimes' include an English abstract, while another 25% ($n$ = 13) do not publish in Spanish, suggesting a broadly internationalised but varied profile. In contrast, the pattern in Arts and Humanities was more dichotomous: 66.7% ($n$ = 4) 'Always' include an English abstract, while the remaining 33.3% ($n$ = 2) reported 'Never' or 'Sometimes' doing so, and none publish exclusively in English.

Overall, the data suggest that technical and scientific fields engage more frequently in English-language publishing practices, whereas the Humanities maintain a stronger presence in Spanish, even though English abstracts remain relevant. Despite these disciplinary differences, the Kruskal–Wallis statistical test did not reveal a significant relationship ($p$ = 0.758) and the Spearman's rank-order correlation did not show correlation between the different academic areas and the frequency of requests for abstracts in English ($p$ = 0.577). None of the other variables examined in the study, namely gender ($p$ = 0.650), age ($p$ = 0.745), professional category ($p$ = 0.502), and years of research experience ($p$ = 0.427), showed any statistically significant correlation with the frequency of requests for abstracts in English.
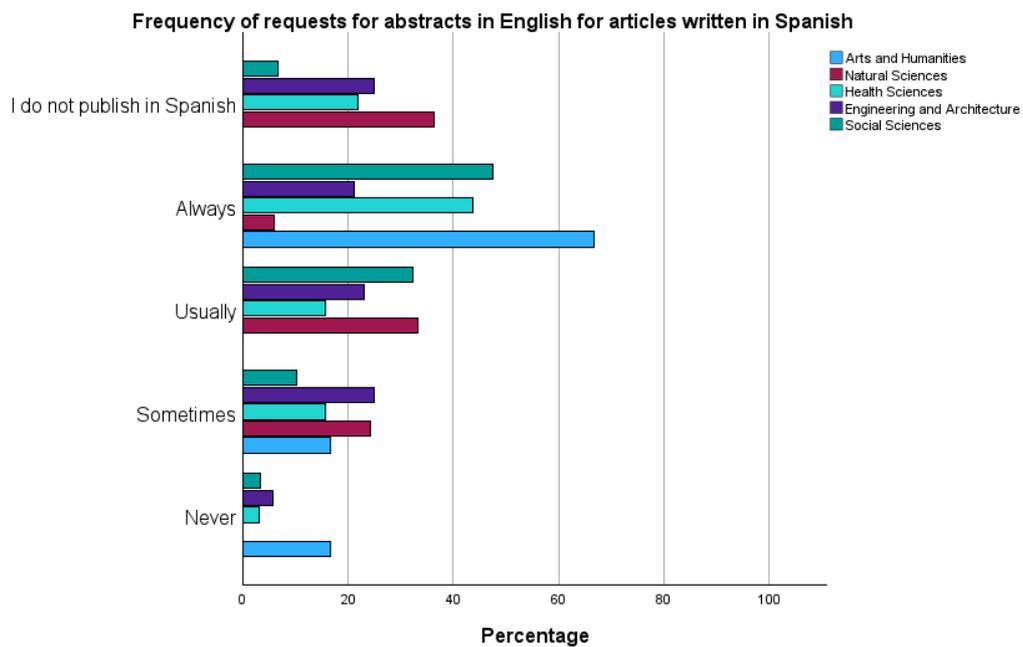
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**Frequency of requests for abstracts in English for articles written in Spanish**



*Figure 1. Frequency of requests for abstracts in English for articles written in Spanish*

## 3.2. Perception and use of NMT and chatbots for drafting and translating abstracts in/into English

Given the relevance of NMT and chatbots both within and beyond the LSS, this subsection examines their use in drafting and translating abstracts in/into English, distinguishing between NMT, on the one hand, and chatbots, on the other. As illustrated in Figure 2, their usage is uneven and varies considerably across academic disciplines.
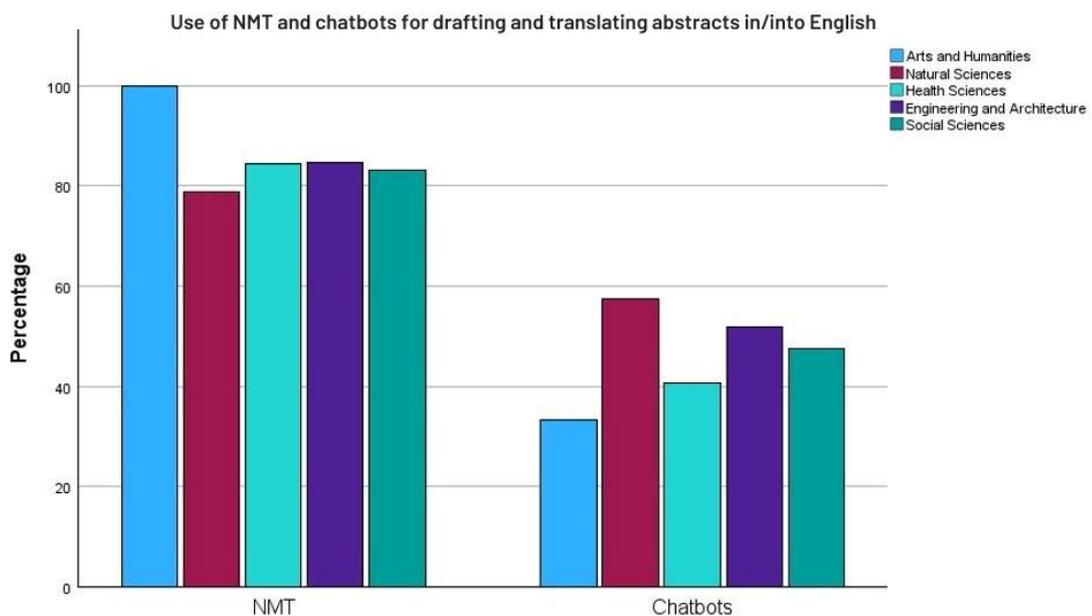


*Figure 2. Use of NMT and chatbots for drafting and translating abstracts in/into English*

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### 3.2.1. Use and perceived quality of NMT

NMT is widely integrated into scholarly communication, specifically for drafting and translating abstracts in/into English, across disciplines. Arts and Humanities lead with full adoption, as 100% ($n = 6$) of respondents reported using NMT tools. This is followed closely by Engineering and Architecture (84.6%, $n = 44$), Health Sciences (84.4%, $n = 27$), and Social Sciences (83.1%, $n = 28$). Although Natural Sciences scholars reported a slightly lower rate (78.8%, $n = 26$), this still represents a high level of adoption. Given the similarity among areas, no statistically significant differences were found among disciplines in the use of NMT tools ($p = 0.776$), nor was any correlation observed between academic areas and the use of these tools ($p = 0.989$). Furthermore, none of the other variables examined in the study, namely gender ($p = 0.647$), age ($p = 0.780$), professional category ($p = 0.978$), and years of research experience ($p = 0.746$), showed any statistically significant correlation.
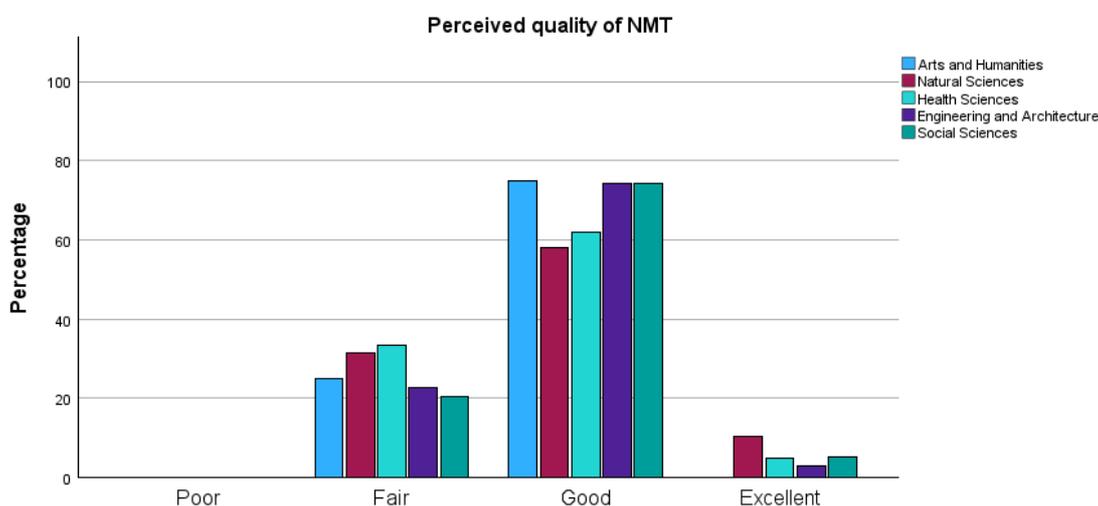


Figure 3. Perceived quality of NMT

When scholars were asked to evaluate the quality of NMT (see Figure 3), responses generally reflected a positive perception across academic disciplines. In Arts and Humanities, 75% ($n = 3$) rated NMT quality as 'Good' and 25% ($n = 1$) as 'Fair', with no responses indicating 'Poor' or 'Excellent', suggesting a critical yet pragmatic view of the tool. In Engineering and Architecture, 74.3% ($n = 26$) also rated the quality as 'Good', 22.9% ($n = 8$) as 'Fair', and 2.9% ($n = 1$) as 'Excellent', reflecting a generally positive experience, possibly due to the consistent use of technical terminology in this field.

A similar pattern was observed in Social Sciences, where 74.4% ($n = 29$) described NMT as 'Good', 20.5% ($n = 8$) as 'Fair', and 5.1% ($n = 2$) as 'Excellent'. This indicates overall confidence in the tool, albeit with some reservations. In Health Sciences, perceptions were slightly more reserved: 61.9% ($n = 13$) rated the quality as 'Good', 33.3% ($n = 7$) as 'Fair', and 4.8% ($n = 1$) as 'Excellent'. This more cautious evaluation may stem from the precision required in medical terminology. In Natural Sciences, 57.9% ($n = 11$) considered NMT quality to be 'Good', 31.6% ($n = 6$) 'Fair', and 10.5% ($n = 2$)

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'Excellent'. This represents the highest proportion of highly positive evaluations among all disciplines, although overall perceptions within this group were more mixed.

Across all fields, no respondents rated NMT as 'Poor', and most viewed it as 'Good', supporting the notion that NMT is useful in practical terms but not yet regarded as fully reliable or excellent. Despite the variations in perception, the differences among disciplines were not statistically significant ($p = 0.905$). In addition, none of the other variables examined in the study, namely gender ($p = 0.125$), age ($p = 0.118$), professional category ($p = 0.502$), and years of research experience ($p = 0.145$), showed any statistically significant correlation with the perceived quality of NMT.

### 3.2.2. Use of chatbots

As illustrated in Figure 2, the use of chatbots as conversational assistants when drafting and translating abstracts in/into English is still emerging and less widespread. The highest adoption rates are found in Natural Sciences (57.6%, $n = 19$) and Engineering and Architecture (51.9%, $n = 27$), followed by Social Sciences (47.5%, $n = 28$) and Health Sciences (40.6%, $n = 13$). In contrast, only 33.3% ($n = 2$) of Arts and Humanities respondents reported using chatbots. Nonetheless, these differences are not statistically significant ($p = 0.613$), and no statistically significant correlation was found ($p = 0.858$) between academic areas and the use of chatbots.

However, statistically significant correlations were found between the use of chatbots for drafting and translating abstracts in/into English and two variables of the study: years of research experience ($p = 0.015$) and age ($p = 0.030$). To better understand these associations, we further explored the descriptive statistics and conducted additional analyses to assess statistically significant differences across relevant groups, as described below.

Regarding years of research experience, as illustrated by Figure 4, the most notable differences in chatbot usage for drafting and translating abstracts in/into English appear in three specific groups: 0–10 years, 21–30 years, and 31–40 years of experience. In the group with 0–10 years of experience, 63% ($n = 34$) of scholars reported using chatbots, compared to 37% ($n = 20$) who did not. In contrast, in the group with 21–30 years of experience, 66.7% ($n = 26$) indicated they did not use chatbots, while only 33.3% ($n = 13$) did. Interestingly, in the group with 31–40 years of experience, 60% ($n = 6$) reported using chatbots, whereas 40% ($n = 4$) did not. The group with 11–20 years of experience was the most balanced, with 45.6% ($n = 36$) using chatbots and 54.4% ($n = 43$) not using them.

A Kruskal–Wallis test confirmed a statistically significant difference among the groups ($p = 0.031$), suggesting that the amount of research experience scholars influences the use of chatbots. Overall, the data indicate a trend in which scholars with less research experience are more likely to adopt chatbot technology for drafting and translating abstracts in/into English.

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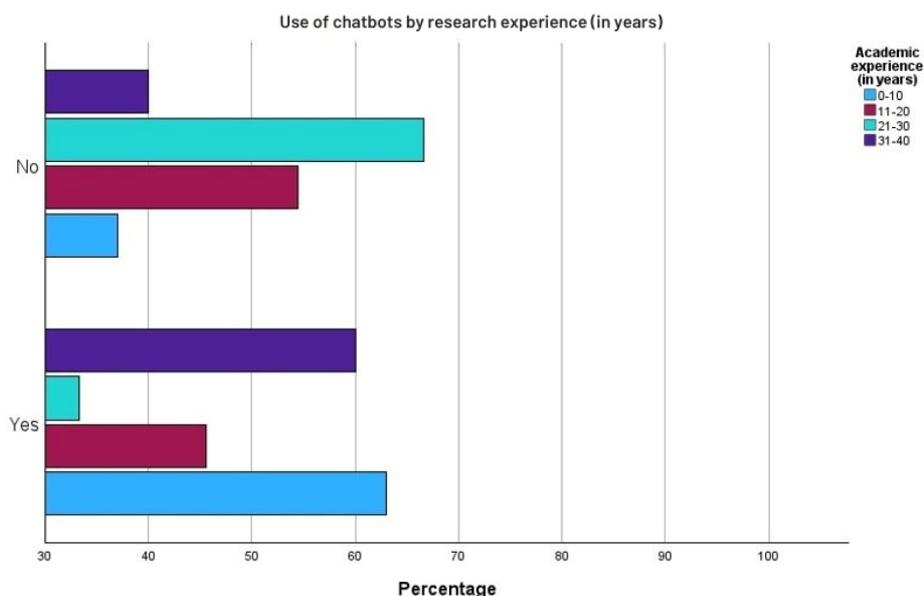**Use of chatbots by research experience (in years)**

Figure 4. Use of chatbots by research experience (in years)

As for age, Figure 5 shows that there are relevant differences within all the age ranges, except the 51–60 age range. In the two first age ranges, that is, the youngest scholars, those who reported using chatbots (66.7%, $n$ = 14 for 21–30; and 65.1%, $n$ = 28 for 31-40) outnumber those who did not report using chatbots (33.3%, $n$ = 7 for 21–30; and 34.9%, $n$ = 15 for 31-40) for drafting and translating abstracts in/into English. In contrast, in the three remaining age ranges, with older scholars, the trend is the opposite: there are fewer scholars who use chatbots (38.2%, $n$ = 29 for 41–50; 44.7%, $n$ = 17 for 51–60; and 25%, $n$ = 1 for 61–70) than scholars who do not use chatbots (61.8%, $n$ = 47 for 41–50; 55.3%, $n$ = 21 for 51–60; and 75%, $n$ = 3 for 61-70). A Kruskal–Wallis test confirmed a statistically significant difference among the groups ($p$ = 0.019), suggesting that age influences the use of chatbots. The data indicate an inverse relationship between age and the use of chatbots for drafting or translating abstracts in/into English among Spanish scholars outside the LSS.
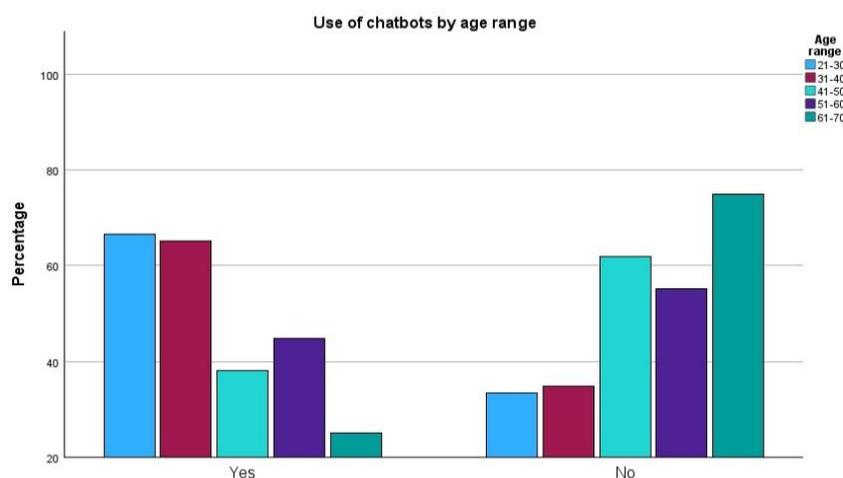
**Use of chatbots by age range**

Figure 5. Use of chatbots by age range

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## 3.3. Familiarity with and use of PE

Familiarity with PE differs substantially across the academic disciplines, although unfamiliarity is generally prevalent. The Engineering and Architecture discipline has the highest reported level of knowledge of the concept: 40.4% ($n$ = 21) say they know what PE is, while 59.6% do not. In Social Sciences (33.9%, $n$ = 20), Natural Sciences (33.3%, $n$ = 11), and Health Sciences (28.1%, $n$ = 9), the percentages show similarity in the degree of knowledge. In contrast, the Arts and Humanities discipline has the lowest level of knowledge of the concept: only 16.7% ($n$ = 1) acknowledged that they know what PE is, whereas 83.3% ($n$ = 5) do not. These data suggest a gap in training in or exposure to technical concepts related to NMT, particularly in relatively humanistic disciplines. Despite the high use of NMT tools in general, the low levels of knowledge of PE indicate that many scholars use such tools without necessarily being fully aware of the best practices for preserving the quality of the target text. This might indicate a need for cross-training for a linguistically focused skill like PE. However, no statistically significant differences ($p$ = 0.693) or correlations ($p$ = 0.559) were found between the academic areas and familiarity with PE.

Nevertheless, statistically significant correlations were found in two study variables: age ($p$ = 0.011) and professional category ($p$ = 0.019). To gain a clearer understanding of these associations, we delved deeper into the descriptive statistics and carried out further analyses to identify any statistically significant differences among the relevant groups, as described below.

As shown in Figure 6, most Spanish scholars outside the LSS are not familiar with PE and the levels of unfamiliarity are relatively consistent across age groups. Specifically, 76.2% ($n$ = 16) of respondents aged 21–30, 74.4% ($n$ = 32) of those aged 31–40, 67.1% ($n$ = 51) of those aged 41–50, and 50% in both the 51–60 ($n$ = 19) and 61–70 ($n$ = 2) age ranges reported a lack of familiarity with PE. The Kruskal–Wallis test did not confirm a statistically significant difference among the groups ($p$ = 0.130). However, a correlation was observed between age range and familiarity with PE, indicating that older scholars tend to be more familiar with PE than their younger counterparts. This trend may be explained by the historical evolution of MT: earlier forms of MT, such as rule-based and statistical MT, often required extensive PE to ensure acceptable output quality. As a result, more experienced scholars who engaged with these earlier technologies may have developed greater familiarity with PE. In contrast, younger scholars, who primarily use more advanced NMT systems, may have had less exposure to traditional PE practices, as the output quality of NMT typically requires a different, and sometimes lighter, form of PE.
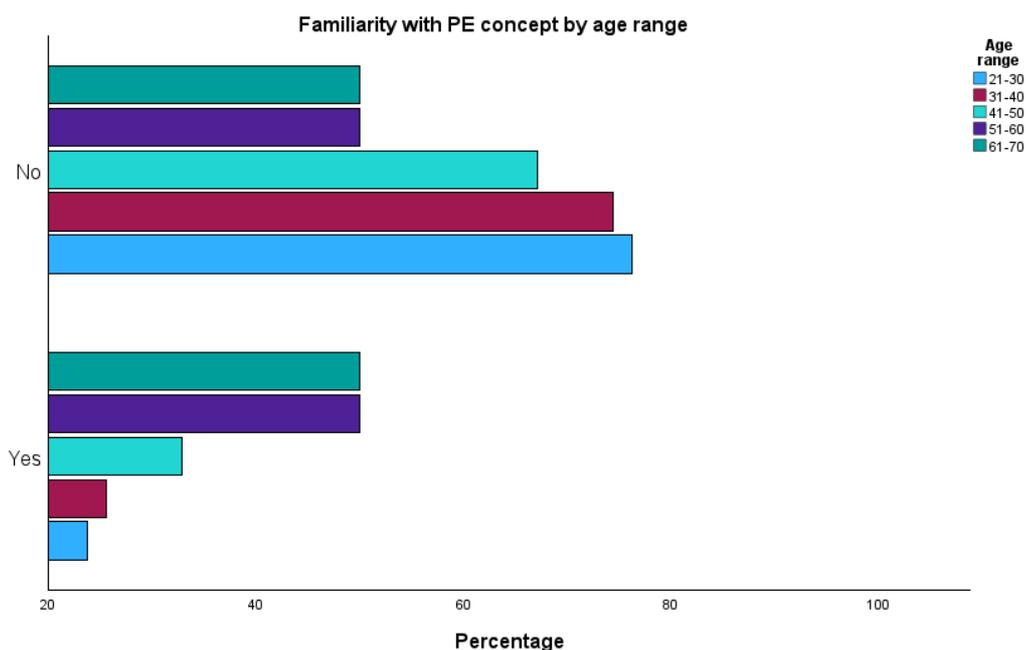
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*Figure 6. Familiarity with PE concept by age range*

Regarding professional category, the results align closely with those observed for age. As shown in Figure 7, the majority of Spanish scholars outside the LSS are unfamiliar with PE, with levels of unfamiliarity exceeding 50% across nearly all professional categories. The sole exception is the category 'Professor', where only 31.3% ($n = 5$) reported such unfamiliarity. In contrast, the percentages elsewhere were as follows: 100% ($n = 1$) for 'Visiting Professor/Lecturer', 77.8% ($n = 7$) for 'Adjunct Lecturer', 75% for both 'Predoctoral Fellow' ($n = 12$) and 'Postdoctoral Fellow' ($n = 15$), 68.4% ($n = 13$) for 'Assistant Professor', 67% ($n = 63$) for 'Associate Professor', 66.7% ($n = 2$) for 'Other (laboratory technicians, corporate researchers)', and 50% ($n = 2$) for 'Temporary Lecturer'.

Due to this overall consistency, the Kruskal–Wallis test did not reveal statistically significant differences among professional categories ($p = 0.662$). Nevertheless, a correlation did emerge: lower familiarity with PE appears to be characteristic of scholars outside the LSS, regardless of professional rank. This widespread lack of awareness highlights a pressing need for targeted training in PE to enhance scholars' ability to effectively use and refine machine-generated translations in academic contexts.

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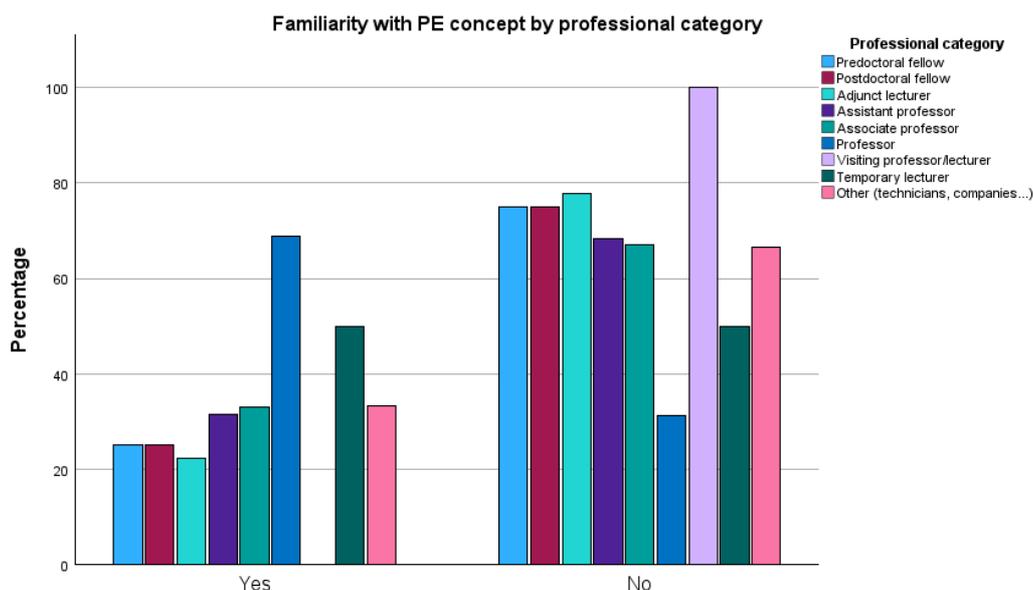Revista Tradumàtica 2025, Núm. 23



*Figure 7. Familiarity with PE concept by professional category*

Given that unfamiliarity with the concept of PE was anticipated, the questionnaire included a clarifying question to ensure respondents understood the term. Question 22 asked: "Have you ever post-edited a machine-generated translation? That is, have you used the translation output of a machine translation tool and modified it to improve the translation?" The responses to this question, shown in Figure 8, reveal a notable contrast with the answers to the earlier question about familiarity with the term PE. In this case, the majority of scholars across all disciplines reported having engaged in PE, even if they were not familiar with the term itself.

Affirmative responses ranged from 69.7% to 83.3% across disciplines: 83.3% ($n = 5$) for Arts and Humanities, 76.9% ($n = 40$) for Engineering and Architecture, 72.9% ($n = 43$) for Social Sciences, 71.9% ($n = 23$) for Health Sciences, and 69.7% ($n = 23$) for Natural Sciences. This widespread practice of PE, despite a general lack of conceptual familiarity with the term, suggests that scholars often engage in PE intuitively or out of necessity. The consistency across academic areas is supported by the absence of statistically significant differences among them ($p = 0.924$). In addition, none of the other variables examined in the study, namely gender ($p = 0.227$), age ($p = 0.831$), professional category ($p = 0.893$), and years of research experience ($p = 0.061$), showed any statistically significant correlation with question 22.

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**Have you ever post-edited a machine-generated translation? That is, have you used the translation output of a machine translation tool and modified it to improve the translation?**
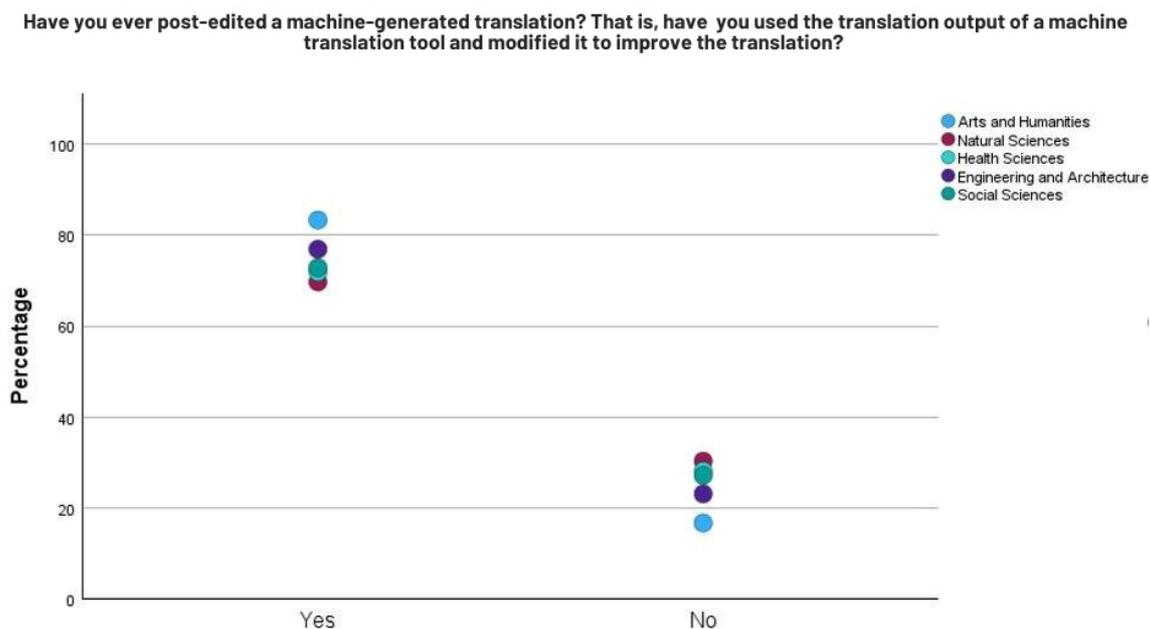


*Figure 8. Have you ever post-edited a machine-generated translation? That is, have you used the translation output of a machine translation tool and modified it to improve the translation?*

Given that the GAMETRAPP project focuses specifically on the PE of research abstracts, the questionnaire included a dedicated question on this practice. As illustrated in Figure 9, a majority of Spanish scholars outside the LSS reported having post-edited machine-generated translations of abstracts. Reported engagement with this task ranged from 54.5% to 66.7% across disciplines: 66.7% ($n$ = 4) in Arts and Humanities, 66.1% ($n$ = 39) in Social Sciences, 65.6% ($n$ = 21) in Health Sciences, 63.4% ($n$ = 33) in Engineering and Architecture, and 54.5% ($n$ = 18) in Natural Sciences. This consistent trend across academic areas likely reflects the increasing integration of NMT into scholarly workflows and the corresponding need for manual refinement to ensure quality and accuracy in key academic texts such as abstracts.

No statistically significant differences were found between disciplines ($p$ = 0.429), nor were there statistically significant correlations with any of the study's key variables: gender ($p$ = 0.479), age ($p$ = 0.411), years of research experience ($p$ = 0.160), and professional category ($p$ = 0.358).

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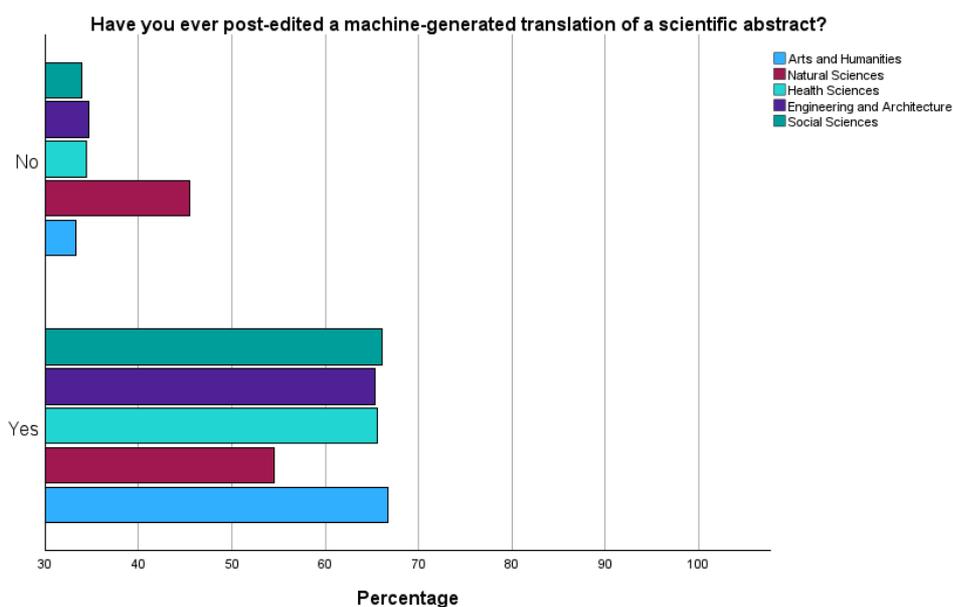Revista Tradumàtica 2025, Núm. 23

Figure 9. Have you ever post-edited a machine-generated translation of a scientific abstract?

## 3.4. Usefulness of an app for training in the PE of research abstracts translated from Spanish into English

Question 26, which asked about the perceived usefulness of an app for training in the PE of research abstracts translated from Spanish into English, is a central component of this study. Given the previously observed unfamiliarity with the concept of PE, it was anticipated that most Spanish scholars outside the LSS would view such a training app as beneficial. As shown in Figure 10, the majority of respondents across disciplines rated the app as 'Very useful': 83.3% ($n$ = 5) in Arts and Humanities, 68.6% ($n$ = 22) in Health Sciences, 57.6% ($n$ = 34) in Social Sciences, 50% ($n$ = 26) in Engineering and Architecture, and 42.4% ($n$ = 14) in Natural Sciences. At the opposite end of the scale, a small minority rated the app as 'Not useful at all', including 9.1% ($n$ = 3) in Natural Sciences, 6.3% ($n$ = 2) in Health Sciences, and 3.4% ($n$ = 2) in Social Sciences.

Despite these variations, no statistically significant differences were found among academic disciplines ($p$ = 0.158), nor was there a significant correlation between discipline and perceived usefulness ($p$ = 0.749). Among the other study variables, gender was the only one to show a statistically significant correlation ($p$ = 0.019), while age ($p$ = 0.235), years of research experience ($p$ = 0.977), and professional category ($p$ = 0.662) did not. The significance found in relation to gender was explored in further detail to better understand this association, as described below.
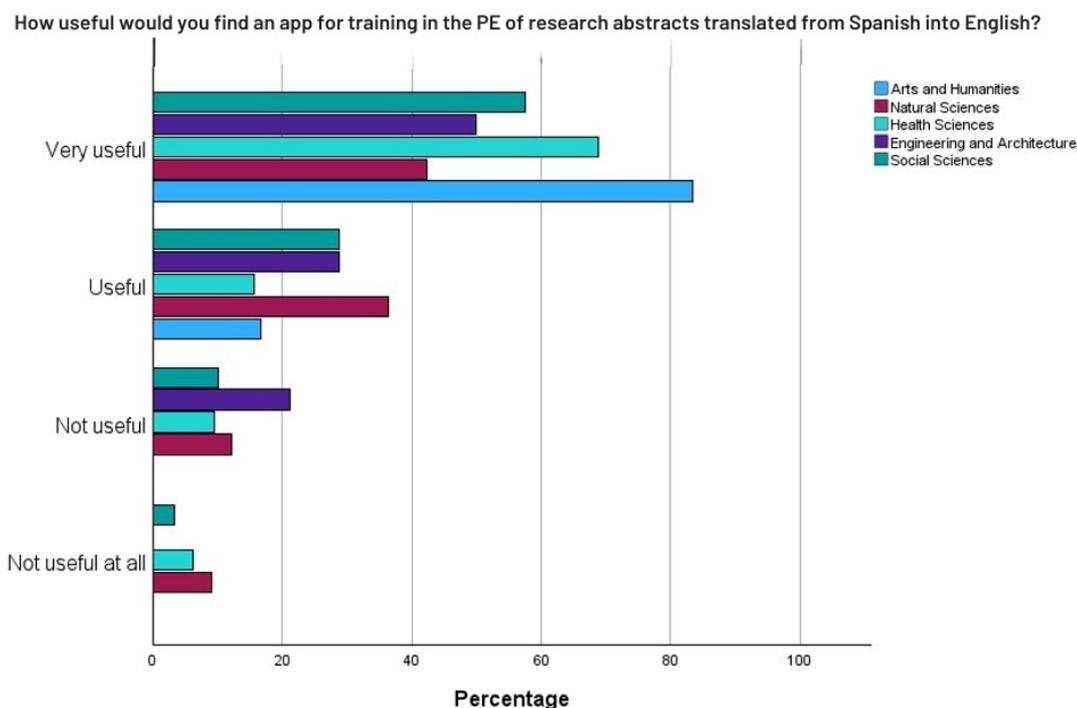
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How useful would you find an app for training in the PE of research abstracts translated from Spanish into English?



*Figure 10. How useful would you find an app for training in the PE of research abstracts translated from Spanish into English?*

As shown in Figure 11, gender-based differences emerged in the perceived usefulness of an app for training in the PE of research abstracts. Notably, 17.3% of male respondents ($n = 18$) rated the app as 'Not useful', compared to only 7.7% of female respondents ($n = 6$). In contrast, 48.1% of male scholars ($n = 50$) deemed the app 'Very useful', while this percentage rose to 65.4% ($n = 51$) among female scholars. A difference in percentages was also observed between each gender's rating of such an application as 'Useful': 30.8% of male respondents ($n = 32$) chose this option, compared to 23.1% of female respondents ($n = 18$). The trend across the categories suggests a more favourable perception among female participants.

A Mann–Whitney U test comparing male and female groups confirmed a statistically significant difference ($p = 0.019$), indicating a correlation: female Spanish scholars outside the LSS are more likely than their male counterparts to view the development of such a training app positively.
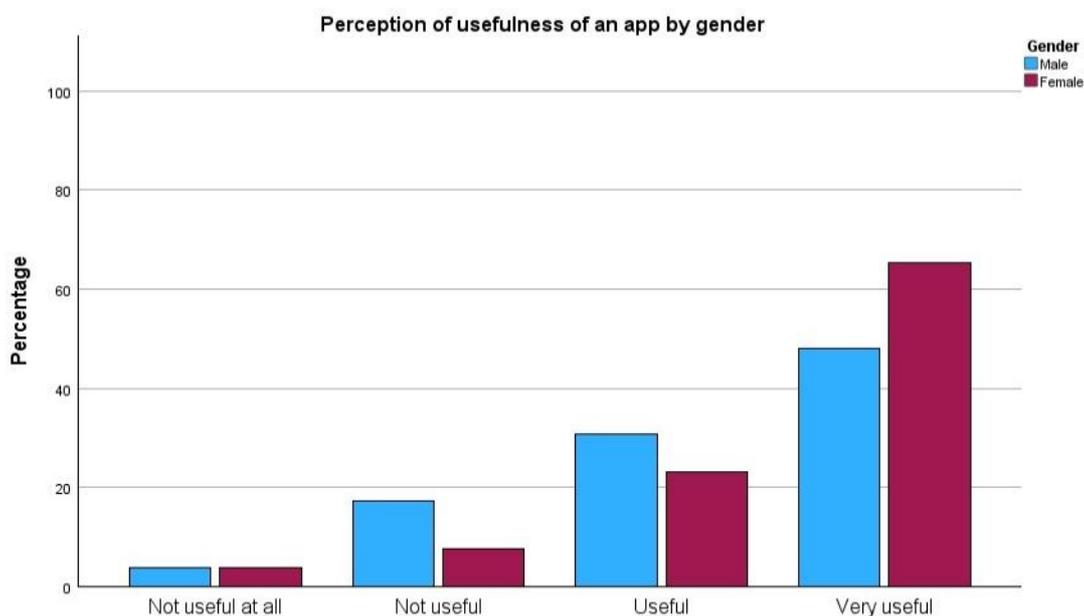
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Figure 11. Perception of usefulness of an app by gender

## 3.5. Sentiment analysis of open-ended item

Sentiment analysis — also referred to as topic detection or opinion mining — aims to identify individual attitudes within textual content such as sentences or entire documents. As described by Luo et al. (2013), this process uses natural language processing, computational linguistics, and text analytics to determine the polarity of sentiment expressed by an author. Sentiment polarity quantifies the degree of sentiment: a high positive score reflects a favourable view, a low negative score indicates an unfavourable view, and a mid-range score denotes a neutral sentiment.

A total of 29 qualitative responses were received from the open-ended question (item 27), which invited participants to provide further comments on the questionnaire or to elaborate on their views regarding NMT or PE. These responses were distributed as follows: Natural Sciences (6), Health Sciences (7), Engineering and Architecture (8), Social Sciences (8), and none from Arts and Humanities. Sentiment analysis was conducted using Atlas.ti software to categorise and interpret the scholars' viewpoints.

The results of the sentiment analysis indicate an overall tendency toward negative attitudes, particularly from scholars in Natural Sciences, where five out of six comments were negative and one was neutral.

Negative: "I personally wouldn't see the need for this application, but perhaps other colleagues with a different level of English proficiency could benefit from it." (R189)[4]

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[4] Original quote in Spanish: "Yo personalmente no vería necesaria esta aplicación, pero tal vez otros compañeros con un dominio del inglés diferente sí se pudieran beneficiar."

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Neutral: "I always consider it important that machine translation should correct and help improve the researcher's English or at least simplify the task of summarising (with subsequent revision). But I don't think that any technology should take away the need for a researcher to have a C1 in English. In short, it is important that the tool be used proactively rather than passively." (R8)[5]

In contrast, Social Sciences presented a more balanced distribution, with two positive, two negative, and four neutral responses.

Positive: "Writing well beforehand, be it in Spanish or English, is essential to get a good text in English." (R140)[6]

Negative: "I don't know what post-editing is, so the last few questions don't make sense." (R67)[7]

Neutral: "Normally, I write abstracts in English myself based on an abstract already written in Spanish, although I usually seek help from the dictionary and DeepL. In any case, I always do it and revise it personally because my perception is that machine translation can trip you up.

If I write an article with a foreign colleague and our working language is English, we do it directly and request a revision." (R216)[8]

Engineering and Architecture followed a similar pattern (one positive, two negative, and five neutral).

Positive: "In the last year, I have regularly used ChatGPT when part of a paper written entirely in English doesn't sound quite right to me when I read it, using questions in English to improve grammar and conciseness in those sentences. I then edit the answer as I see fit." (R173)[9]

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[5] Original quote in Spanish: "Siempre considero importante que la traducción automática debe corregir y ayudar al investigador a perfeccionar su nivel de inglés o en todo caso a simplificar la tarea de resumir (con revisión posterior). Pero no considero que ninguna tecnología deba suplir la necesidad de cualquier investigador de tener un C1 de inglés. En definitiva, es importante que se haga un uso proactivo de la herramienta y no tanto pasivo."

[6] Original quote in Spanish: "La redacción previa ya sea en castellano o inglés es fundamental para tener un buen texto en inglés."

[7] Original quote in Spanish: "No sé qué es posedición por lo que las últimas preguntas no tienen sentido."

[8] Original quote in Spanish: "Normalmente, lo resúmenes en inglés los redacto yo misma a partir del resumen ya elaborado en español, aunque suelo buscar ayuda del diccionario y el deepl. En cualquier caso, siempre lo hago y reviso personalmente pues mi percepción es que los traductores automáticos pueden jugar malas pasadas. Si escribo un artículo con un colega extranjero en el que nuestra lengua vehicular es el inglés, lo hacemos directamente y solicitamos la revisión."

[9] Original quote in Spanish: "En el último año suelo utilizar ChatGPT en alguna parte de un paper escrito al completo en inglés que al leer no me suena del todo bien, con preguntas en inglés para mejorar la gramática y la concisión en esas frases. Posteriormente edito lo que me resulta interesante de la respuesta."

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Negative: "I don't know what post-editing is, so I can't answer question 26 correctly." (R192)[10]

Neutral: "Personally, what I find most difficult is to determine whether an expression or the construction of a sentence is correct from the point of view of a native English speaker." (R62)[11]

Health Sciences stood out as the most neutral group, with six out of seven comments being neutral and only one negative.

Negative: "I have been a professional medical translator, as well as a researcher, since 1994 and I believe that machine translation systems with subsequent post-editing are greatly impoverishing scientific translations." (R83)[12]

Neutral: "You have to be fluent in English, in science it is not acceptable to write in Spanish and then translate it." (R161)[13]

No comments were submitted by participants from Arts and Humanities, making it impossible to draw conclusions about attitudes in that group.

As detailed above, the results of the sentiment analysis indicate an overall tendency toward negative attitudes among Spanish scholars outside the LSS. However, when these negative sentiments are compared with responses to earlier questions in the questionnaire, particularly those concerning the use and perceived quality of NMT, two key trends emerge. First, despite the generally negative attitudes, NMT is widely used among Spanish scholars outside the LSS, with usage rates ranging from 78.8% to 100%. This raises an important question for further exploration: could more frequent engagement with NMT be associated with more critical views of the technology?

Second, although the overall sentiment is negative, respondents across all disciplines primarily rated the quality of NMT as 'Good', with an average of 63%. Notably, Natural Sciences scholars had the highest percentage of respondents rating NMT quality as 'Excellent' (10.5%), yet they also exhibited some of the most negative attitudes toward its use. These findings lead to another question for further research: do users of NMT tend to develop negative opinions about the technology regardless of their assessment of its quality?

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[10] Original quote in Spanish: "Desconozco lo que es la posición [sic] por lo tanto la pregunta 26 no la conozco correctamente."

[11] Original quote in Spanish: "A mí personalmente lo que más dificultad me entraña es poder determinar si una expresión o la construcción de una frase es correcta desde el punto de vista de un nativo angloparlante."

[12] Original quote in Spanish: "Soy traductor médico profesional, además de investigador, desde 1994 y considero que los sistemas de traducción automática con revisión tras la edición están empobreciendo mucho la calidad de las traducciones científicas."

[13] Original quote in Spanish: "Hay que tener fluidez en inglés, en ciencia no es válido escribir en español y luego traducirlo."

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## 4. Conclusions

This paper presents an overview of the perspectives and attitudes of Spanish scholars outside the LSS regarding NMT and PE, based on responses to a questionnaire completed by 253 scholars from 42 institutions across Spain. A two-stage participant selection process was applied for the final analysis. In the first stage, only respondents who self-reported an English proficiency level of B2, C1, or C2 according to the CEFR were included ($n = 221$), as these levels represent advanced to proficient competence. In the second stage, 39 participants from linguistic disciplines, specifically the fields of translation and languages, were excluded due to their likely association with the LSS. This yielded a final sample of 182 participants from non-linguistic fields, grouped into five academic areas: Social Sciences, Engineering and Architecture, Natural Sciences, Health Sciences, and Arts and Humanities. This classification enabled the exploration of potential similarities and differences between disciplines.

To address RQ1, findings indicate that NMT is widely integrated into scholarly communication, particularly in the drafting and translation of abstracts in/into English, across all disciplines. The reported use of NMT among Spanish scholars outside the LSS ranges from 78.8% to 100%, depending on the academic field. When compared to data obtained by Parra Escartín et al. (2017), who examined NMT use among medical professionals for academic writing, the results show a comparable level of adoption (89% in our study versus 78.6% in theirs). The higher percentage in the present study may be attributed in part to the eight-year interval between the two studies, during which time NMT technology has become more accessible and refined.

As for the use of chatbots for drafting and translating abstracts, our study shows that adoption among Spanish scholars outside the LSS is still emerging, with 56% of respondents reporting using them for such purposes. When compared with the findings of Li et al. (2024), which, although based on students rather than scholars, still pertain to an academic context, a notably higher adoption rate is observed in the earlier study: 92% reported using ChatGPT to enhance homework quality and improve writing. The same percentage viewed the tool as useful for learning to translate and improving grammar, while 84% used it to assist in paper writing and 76% in academic research or literature review. These findings suggest that the use of chatbots in academic communication is significantly more widespread among students than among Spanish scholars outside the LSS.

Two statistically significant correlations involving the use of chatbots were observed: first, scholars with fewer years of research experience are more likely to use chatbots; second, an inverse relationship exists between age and chatbot usage. These findings suggest a connected trend: younger and less experienced scholars are more inclined to adopt chatbot technologies as conversational aids for drafting and translating abstracts in/into English, compared to their older and more experienced peers.

Regarding RQ2, our study revealed a notable lack of awareness of PE, with more than half of the Spanish scholars outside the LSS not knowing what PE is. In addition, two

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correlations were found. First, older scholars tend to be more familiar with PE than their younger counterparts, maybe due to earlier forms of MT that required extensive PE. Second, there is a negative correlation indicating that lower familiarity with PE appears to be characteristic of scholars outside the LSS, regardless of professional rank. The only prior study offering data on specific PE usage in scholarly communication is that of Parra Escartín & Goulet (2017: 260), which reports that 26% of respondents used NMT "to obtain a preliminary English version they could subsequently post-edit." However, the study does not clarify how these scholars engaged in PE, making direct comparison with our PE-related findings difficult and, in most cases, unfeasible.

Despite limited familiarity with PE, between 69.7% and 83.3% of Spanish scholars outside the LSS across all disciplines reported having engaged in PE, even if they were not familiar with the term itself. This widespread engagement suggests that PE is frequently performed intuitively or out of practical necessity, even in the absence of formal training or conceptual understanding.

Regarding the PE of research abstracts, reported engagement ranged from 54.5% to 66.7% across disciplines. This consistent trend likely reflects the growing integration of NMT into academic writing processes and the associated demand for manual refinement to ensure the clarity, precision, and quality of high-stakes texts such as research abstracts.

Addressing RQ3, the majority of respondents across disciplines rated the app as 'Very useful'. Notably, a statistically significant correlation indicates that female scholars outside the LSS are more likely than their male counterparts to view the development of such an app positively. As no previous studies have focused on the development of an app for PE for non-professional translators, our results cannot be directly compared with existing research.

Our study has three main limitations that should be acknowledged. First, it has not been possible to address in detail the specific use of NMT and PE tools, beyond the evaluation of their linguistic quality. We have not delved deeply into other relevant aspects, such as the cognitive processes involved in their use or the strategies followed by users in the execution of PE. This limits our understanding of the real impact of these tools on the work of scholars outside the LSS and their integration in the workflow within the professional and academic environment. Second, the overall response rate to the open-ended question was conspicuously low, which can be attributed to its optional and unstructured nature. Third, the questionnaire did not offer respondents alternative methods for developing basic PE skills. Only one option was presented, which limited the opportunity to compare it with other potential approaches to introducing and promoting PE.

The findings of this study suggest at least three promising avenues for future research. First, there is a clear need to investigate alternative approaches for fostering basic PE literacy, particularly among Spanish scholars outside the LSS. The GAMETRAPP project introduces serious videogame as an innovative strategy to enhance engagement in PE

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training. Future research will be essential to evaluate the effectiveness and pedagogical impact of this approach. Second, further research is needed to examine whether users of NMT tend to express negative attitudes toward the technology regardless of their level of engagement or their perception of its quality. Understanding this apparent paradox could provide valuable insights into user behaviour and technology acceptance. Third, it would be pertinent to explore how PE literacy and skills are evolving within the broader context of AI. As the use of NMT and LLMs becomes increasingly common for translation tasks, PE may be seen as an emerging component of general AI literacy — defined by Chiu et al. (2024) as the combination of AI knowledge, skills, confidence, and effectiveness. In this light, the integration of PE into AI literacy and competency frameworks may become crucial for individuals seeking to navigate the ongoing digital transformation in an informed and responsible manner.

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