

## SELF-EFFICACY AND SELF-AWARENESS IN SCIENTIFIC TRANSLATORS' EDUCATION: A PRELIMINARY STUDY

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**Abstract:** In this paper, we present the results of a preliminary study on the evolution of self-efficacy and self-awareness among scientific translation students throughout one semester using data collected for three academic years. The analysis was based on the two components of self-efficacy: the perception that students have of their own capabilities to perform specific activities related to scientific and technical translation and their actual capabilities to perform those activities. To assess the self-efficacy beliefs of students, we analyzed the evolution of the self-perception of students based on the results of two questionnaires, an initial assessment questionnaire on their translation habits and problems, and a final psychometric questionnaire on the perceived usefulness of the pedagogical method used and on their self-efficacy beliefs. To assess the actual capabilities of students, we analyzed the evolution of the number of errors in each translation assignment and of the academic scores of students. The comparative analysis of the diagnostic assessment questionnaire and the diagnostic assessment translation assignment revealed low self-awareness at the beginning of the semester, as evidenced by a poor correspondence between students' perceptions and performance. In contrast, a high degree of correspondence was found between self-efficacy beliefs and academic performance at the end of the semester, which suggests that the implemented method helped students develop realistic self-efficacy beliefs.

**Keywords:** Self-efficacy; self-awareness; scientific translation; task performance; assessment



## Introduction

The limited ability of students to anticipate translation problems, find the correct strategy to solve them, spot errors and mitigate or justify good decisions, often made routinely or unconsciously, is a major issue in translator education, insofar as these shortcomings will probably lead students to failure in selecting the appropriate strategies to produce a good translation. Often, students' choice of translation strategies is affected by their motivation, cognition and beliefs. Haro Soler (2019b) explored a number of concepts related to self-perception, like self-efficacy, which is composed of the capabilities of students to perform a specific activity (self-efficacy) and their self-perception of those capabilities (self-efficacy beliefs). When applied to translation, the author defined self-efficacy beliefs as the confidence or perception that a translator has on their self-efficacy or capabilities to translate.

Specifically, self-efficacy beliefs affect motivation, information processing and strategy selection, particularly when self-perception and self-performance do not match. For this reason, translator educators must be aware of the impact of self-efficacy on the prediction of competence (Bontempo & Napier, 2011), performance (Ayllón, Alsina & Colomer, 2019; Kontinen, 2022) and motivation (Shaw, 2011), in order to incorporate tasks that contribute to improving the translation-related knowledge of students and their confidence and efficacy (Araghian, Ghonsooly & Ghanizadeh, 2018; Kontinen, 2022) and, consequently, the correspondence between their beliefs and their practices. Yet, introducing changes in the organization of a course requires measuring the self-efficacy of students (Bolaños-Medina & Núñez, 2018) and identifying the most suitable practices to enhance their self-efficacy beliefs (Haro Soler, 2019b). According to the literature, among these practices are experience, reflective practice and constructive feedback.

In general, expertise often leads to increased self-confidence and self-efficacy. In a study of the impact of different levels of task difficulty and expertise on self-efficacy judgements, Ho (2010)

found a significant and positive relationship between expertise and perceived self-efficacy, *i.e.*, subjects with more expertise showed high levels of self-efficacy and subjects with low level of expertise showed low levels of self-efficacy. On the contrary, task difficulty correlated negatively with perceived self-efficacy, whereas perceived self-efficacy correlated positively with task performance. Thus, increased task difficulty led to poorer self-efficacy and performance. This finding is in agreement with Bandura (1997), who claimed that the judgement of personal efficacy depends also on the levels of task difficulty as perceived by the performer.

Yet, experience is not sufficient insofar as learners do not learn directly from experience, but from reflecting on experience (Schön, 1983; Mezirow, 1990; Brookfield, 1995; Mezirow, 1996). In translator education, there is now widespread acknowledgement of the need to promote self-reflection, as it leads to enhanced self-awareness and, hence, to increased self-efficacy (Atkinson & Creeze, 2014; Norberg, 2014; Krogstie & Krogstie, 2016; Haro Soler, 2019b; Haro Soler, 2021). Krogstie & Krogstie (2016) studied the relationship between reflective learning and self-efficacy and found that, if appropriately supported, the reflective learning cycle can lead to increased self-efficacy. Yet, they also suggested that self-efficacy could suffer from the experience of not being able to bring about change or apply the outcome of reflection (Krogstie & Krogstie, 2016).

When reflecting on translation, students focus on constructing knowledge by searching for explanations, interpretations and predictions instead of focusing on finding the right answer (Pietrzak, 2019), thus activating learning, self-analysis, the ability to relate theoretical and practical knowledge and, eventually, the ability to identify and solve problems, which is essential in translation competence acquisition (Martínez Melis & Hurtado Albir, 2001; Presas, 2012; Angelone, 2013; Massey, 2017; Rodríguez-Inés & Fox, 2018; Núñez & Bolaños-Medina, 2018; Angelone, 2019; Galán-Mañas, 2019; PACTE, 2019; Kovács & Harangus, 2019). A variety of approaches have been used to implement reflective learning

in translator education, particularly process-oriented pedagogical methods, such as think aloud protocols (TAPs), IPDR logging, retrospective verbalizations, questionnaires, interviews, changes tracked in a document, post-learning reports, keystroke logging, eye tracking or screen recordings (e.g. Gile, 2004; Shreve, Angelone & Lacruz, 2014; Göpferich, 2013; Ehrensberger-Dow & Massey, 2013; Angelone, 2013, 2015; Ferreira & Schwieter, 2017; Shreve, Angelone & Lacruz, 2018; Pietrzak, 2019). While simultaneous reflection may distort the translation process of students because of the extra effort required by self-reporting at the same time as they are translating, retrospective reflection can help minimize these problems and find a balance between the effort devoted to translating and the effort devoted to reflecting. Among the most common retrospective reflection methods are commented translations (Presas, 2012), written and oral reports on translation solutions (Rodríguez-Inés & Fox, 2018) or reports on translations, self-assessment reports and revised versions of translations (Galán-Mañas, 2016), which are in line with the methods used in this paper to enhance self-awareness and self-efficacy among scientific translation students.

In the field for specialized translation, Mellinger (2019) explored the pedagogical usefulness of retrospective reflective essays for improving student performance in specialized translation. He combined product-based analysis of students' translations with process-oriented reflections and found that students often exhibited limited global awareness of the process and reported translation problems related to medical terminology, neologisms and phraseology, but hardly reflected on the task. Interestingly, he found an increase in metacognitive behavior in only eight weeks and suggested that problem recognition and solution evaluation among specialized translation students can be developed as the result of coursework focused on increasing task awareness. Also, in the field of medical translation, Pietrzak (2019) combined prospective and retrospective reflection using pre- and post-translation questionnaires about students' thoughts and assumptions related to the source text and concluded that students gained more awareness on the translation process and

teachers gained more insight in students' assumptions and concerns. Despite the benefits discussed in the above paragraphs, using these methodologies showed also some shortcomings or limitations. For instance, a potential problem of relying on the information provided by students in written reports can be an inclination to falsification, particularly when summative assessments are involved (Massey, 2017). Yet, when dealing with perception studies, relying on the information provided by students is essential.

Finally, reflective learning must be accompanied by constructive feedback, which helps students gain confidence in their abilities as translators (Atkinson, 2014; Atkinson & Creeze, 2014) and become aware of their strengths (Way, 2008, 2009). In this sense, Atkinson & Creeze (2014) proposed using self-reflection to help students develop realistic self-efficacy beliefs. In the field of specialized translation pedagogy, constructive feedback is particularly relevant for increasing self-confidence because students often feel less confident when exposed to the translation of specialized texts due to their lack of knowledge about the subject area (Le Poder, 2010; Haro-Soler, 2021), which can yet be compensated by a good mastery of research skills (Bolaños-Medina, 2014). Nevertheless, as reported by Hjort-Pedersen & Faber (2009) for legal texts, students know that they need extensive knowledge but they find it difficult to recognize which are their information needs. Likewise, their lack of confidence and self-efficacy is related to their condition of non-experts as readers (Haro Soler, 2019a) and writers of specialized texts (Hjort-Pedersen & Faber, 2009). Educators can positively influence self-efficacy-beliefs through realistic comments that correspond to the students' real ability to translate (Haro-Soler, 2021).

Based on the literature review conducted, for the purposes of this paper we assume that expertise, constructive feedback and reflective practice help students enhance self-efficacy and self-awareness by contributing to the development of realistic self-efficacy beliefs. Specifically, boosting self-awareness helps students become more aware of their needs and their actual level

of skill (Haro Soler, 2019b), which in turn helps them activate the metacognitive strategies required to solve problems and reduce uncertainty (Araghian, Ghonsooly & Ghanizadeh, 2018). As suggested above, when dealing with the translation of scientific and technical texts, reducing uncertainty and gaining confidence is particularly relevant. In agreement with De Young (2000), an efficient use of constructive feedback and reflective practice through assisted revision and self-reflection will help students experience an intrinsic satisfaction resulting from their own competence that will enhance their self-efficacy.

### **Aims and hypotheses**

The aim of the current research is to analyze the evolution of self-awareness and self-efficacy from the beginning to the end of a semester based on the two components of self-efficacy: the perception that students have of their own capabilities to perform specific activities in the field of scientific and technical translation and their actual capabilities to perform those activities.

Based on our observations and on the literature on self-efficacy and reflective learning, we expect an initial deviation between students' perceptions and students' performance at the beginning of the semester. More specifically, it is our hypothesis that in the case of the translation of scientific and technical texts, students initially show low self-awareness of translation problems and errors and that assisted revision and reflective practice tasks help students 1) enhance their self-awareness of translation problems and errors and 2) improve their self-efficacy, in terms of both their actual performance as translators and their self-efficacy beliefs.

The results of this perception study based on a mixed-method approach will help us determine which aspects of the teaching and learning method used are perceived by students as the most contributing to their learning and, consequently, to find areas of improvement. Likewise, the results of this perception study will

help us track progress of students' performance and bring about actual change in the teaching and learning process.

### **Methodology of the study**

The methodology used in this study followed a mixed-method approach that combined product-based analysis of students' translations with process-oriented reflections, and included questionnaires, pre-translation analysis tasks, translations, revisions assisted by the educator and post-revision self-reports aimed at increasing metacognitive behavior and task awareness. The participants, materials and procedures used in this preliminary study are presented below.

### **Participants and setting**

The study was conducted as part of a Scientific and Technical Translation module taught during the seventh semester of the four-year undergraduate program in Translation and Interpreting of the University of Vigo. The study covered three academic years, from 2018 to 2021, and all 76 students enrolled in the module took part in the research. The module is aimed at helping students acquire competence in the specificities of scientific and technical translation and writing. Because translation problems are closely associated with translation errors and with the use of strategies (Hurtado Albir, 2011), the pedagogical approach used in this module focuses on assisted revision and self-reflection (ARSR) to help students recognize problems, errors and strengths in their own translations, categorize them and evaluate the relevant solutions. Under this method, errors are understood as unsuccessful choices (Washbourne, 2015) leading to a translation that falls behind the professional standards; specifically, scientific writing errors are defined as solutions that deviate from scientific writing goals (Alley,

2018). To bring unsuccessful translation into awareness as a learning opportunity, error identification is assisted by the instructor, who marks students' translations using a color code in order to help students recognize their errors, categorize them and associate them to specific translation problems and strategies in order to enhance metacognitive bundling. After that, the students revise their texts using the appropriate resources and strategies, prepare a final version of their translations and write a self-report to justify their revision decisions and reflect on their learning. By improving their ability to identify and minimize problems and errors, categorize errors and improve the use of the appropriate resources and strategies, students are expected to enhance their self-awareness of translation problems and errors and their self-efficacy.

## Procedures and materials

During the semester, students were asked to perform and deliver the tasks shown in Table 1, which included a diagnostic assessment questionnaire (DAQ), four translations, three revised translations (RT) with the corresponding self-reflection reports (SR) and a psychometric questionnaire on the perceptions of students on different aspects of their performance as scientific and technical translators and their beliefs on the usefulness of the ASRS method. A detailed description of the materials is provided below.

**Table 1:** Tasks and materials analyzed in the study

	<b>Task1</b>	<b>Task2</b>	<b>Task3</b>	<b>Task4</b>	<b>Task5</b>	<b>Task6</b>
<b>Type</b>	DAQ	Diagnostic Assessment Translation	Translation 1 + RT + SR	Translation 2 + RT + SR	Translation 3 + RT + SR	Psychometric questionnaire
<b>Scheduling</b>	Week 1	Week 1	Week 3	Week 6	Week 11	Week 14
<b>Focus</b>	Perception	Performance	Performance + perception	Performance + perception	Performance	Perception
<b>Assessment</b>	Diagnostic	Diagnostic	Formative	Formative	Formative	Final
<b>Group size</b>	Individual	Individual	Individual	Groups (3-4)	Individual	Individual

Source: Author

## **Diagnostic assessment questionnaire**

To assess students' self-awareness and self-efficacy beliefs at the beginning of the semester, we used a diagnostic assessment questionnaire that included the following questions about their preliminary perceptions on some of their translation habits, problems and errors:

1. Do you usually analyze the source text before translating it?
2. Do you make planned documentary searches?
3. Do you usually revise your translations before submitting them?
4. Which types of problems do you usually find during the translation process?
5. Which problems correspond specifically to the English-Spanish language pair?
6. Can you easily spot your own errors?

Questions 1, 2, 3 and 6 were formulated as multiple-choice questions, with a box for observations, whereas questions 4 and 5 were open-ended questions. The questions related to translation habits were aimed at finding potential relationships between students' problems/errors and some of their translation habits.

## **Translations and revised translations**

To assess the actual performance of students, four translation assignments, labelled A0, A1, A2 and A3, were performed, delivered and assessed by the instructor during the semester. Table 2 summarizes the characteristics of each assignment.

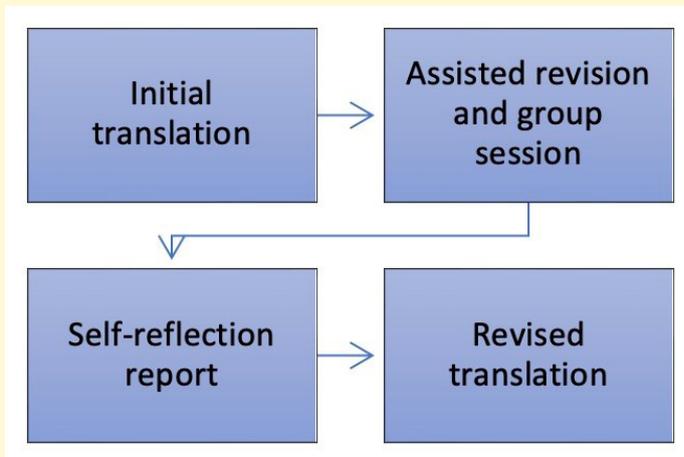
**Table 2:** Characteristics of translation assignments

	<b>Diagnostic assessment (A0)</b>	<b>Assignment 1 (A1)</b>	<b>Assignment 2 (A2)</b>	<b>Assignment 3 (A3)</b>
<b>Text genre</b>	Textbook	General encyclopedia article	Technical characteristics	Clinical review
<b>Topic</b>	Scientific translation	AIDS	Laminated floors	Pharmacology
<b>Text length (words)</b>	375	88	221	443
<b>Assisted revision</b>	Yes	Yes	Yes	Yes
<b>Self-report</b>	No	Yes	Yes	Yes
<b>Difficulty</b>	Easy: terms are explained; simple syntax	Easy: terms are explained; simple syntax	Moderate: terms not explained; simple syntax	Difficult: terms not explained; complex syntax

Source: Author

Assignment A0 was a conventional translation assignment, whereas assignments A1, A2 and A3 followed the stages devised in the assisted revision and self-reflection method (Figure 1, below), which included an initial translation, a self-reflection report and a revised translation of the same text. Assignment A2 was a group assignment, which was scheduled because of the impact of the collective self-efficacy on individual reflection (Krogstie & Krogstie 2016). All the tasks were assessed using a rubric with five performance levels: minimal (1), deficient (2), acceptable (3), strong (4) and standard (5).

**Figure 1:** Tasks included in translation assignments A1, A2 and A3



Source: Author

As in Chodkiewicz (2018), students were not specifically trained in revision but had the opportunity to develop their revision skills by improving their translations. Versions 1 and 3 of the translations were assessed according to the criteria shown in Figure 2. As an aid to error detection and categorization, the particularly good solutions, understood as instances of avoidance of errors commonly observed among scientific translation students, and errors or inconsistencies of version 1 were marked by the instructor according to the color code shown in Figure 3.

**Figure 2:** Rubric used to assess translation assignments

	<b>Minimal (1)</b>	<b>Deficient (2)</b>	<b>Acceptable (3)</b>	<b>Strong (4)</b>	<b>Standard (5)</b>
<b>V1</b>	- The translation would be unacceptable in professional settings.	- The translation would be acceptable with substantial editing.	- The translation would be acceptable with standard editing.	- The translation is correct, smooth and natural, but contains unfamiliar words or terms.	- The translation is correct, smooth and natural.

	<ul style="list-style-type: none"> <li>- It contains major errors or accuracy errors (+4) that seriously affect meaning.</li> <li>- Two spelling errors.</li> </ul>	<ul style="list-style-type: none"> <li>- On the whole, the content is accurate but the writing needs improvement.</li> </ul>	<ul style="list-style-type: none"> <li>- The translation contains minor inaccuracies, calques or grammar errors.</li> </ul>	<ul style="list-style-type: none"> <li>- Meaning is not affected.</li> </ul>	<ul style="list-style-type: none"> <li>- Terminology, style and register are appropriate for the topic and for the specified audience.</li> </ul>
<b>V2</b>	<ul style="list-style-type: none"> <li>- The corrected version does not include changes or it does not extrapolate.</li> <li>- Changes are made, but they are incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>- The corrected version includes changes to most errors, but not all.</li> <li>- The final version includes the suggestions from classroom discussion.</li> <li>- Changes are made, but not all of them are correct.</li> </ul>	<ul style="list-style-type: none"> <li>- The corrected version includes changes to every error, but not all of them are appropriate.</li> <li>- Some personal changes are introduced.</li> <li>- The TT needs minor editing.</li> </ul>	<ul style="list-style-type: none"> <li>- All the changes are appropriate.</li> <li>- Personal suggestions are made.</li> <li>- No additional errors.</li> <li>- No further editing needed.</li> </ul>	<ul style="list-style-type: none"> <li>- All the changes are appropriate.</li> <li>- Some unmarked errors have been corrected.</li> <li>- Solutions show reflection.</li> <li>- The TT needs all the goals of scientific writing.</li> </ul>

Source: Author

**Figure 3:** Color code used to mark translations in assisted revision

Colour	Meaning	Category
1	Particularly good solution	<i>Any category</i>
2	Calque	<i>General translation / writing</i>
3	Major error: Contresens / Omission / Spelling	
4	Mechanics: grammar / syntax / punctuation	
5	Formatting	<i>Format</i>
6	Accuracy	<i>Scientific language goals</i>
7	Clarity/Concision/Fluidness/Familiarity	

Source: Author

## Self-reflection reports

Assignments A1, A2 and A3 included a self-reflection report that comprised a contextualization and analysis of the text, a categorization of the errors marked in assisted revision, a justification for every error, the alternative solutions to errors and a justification for the particularly good solutions marked by the instructor. Students were asked to reflect on their translation actions and on the potential application of what they learnt to further translations.

The performance levels for the report were defined following a top-down approach by creating a conceptual framework for achievement, describing the intended achievement and defining one scale for each criterion, namely context, reflection and use of resources (Figure 4).

**Figure 4:** Rubric used to assess self-reflection reports

	<b>Minimal (1)</b>	<b>Deficient (2)</b>	<b>Acceptable (3)</b>	<b>Strong (4)</b>	<b>Standard (5)</b>
<b>Context</b>	- Lack of prior analysis and contextualisation. - Little or no application of analysis.	- Adequate contextualisation: a brief analysis of at least some of the factors affecting the communication situation is made. - Adequate application: the analysis is applied to the translation or the corrections made.	- Good contextualisation: most of the factors affecting the communication situation are correctly analysed and some translation problems are anticipated. - Good application: the analysis is correctly applied to the translation or the corrections made.	- Very good contextualisation: all of the factors affecting the communication situation are correctly analysed and translation problems are anticipated. - Good application: the analysis is correctly applied to the translation or the corrections made.	- Excellent contextualisation: all of the factors affecting the communication situation are analysed in details and translation problems are anticipated. - Good application: the analysis is correctly applied to the translation or the corrections made.

<b>Reflection</b>	<ul style="list-style-type: none"> <li>- No reflection on the translation and revision processes.</li> <li>- Little or no analysis of errors and good solutions.</li> <li>- Little or no explanation of corrections.</li> </ul>	<ul style="list-style-type: none"> <li>- Self-reflection is limited to some aspects.</li> <li>- Reflection or analysis is limited to classroom discussion.</li> <li>- Corrections are partially explained.</li> </ul>	<ul style="list-style-type: none"> <li>- Some conclusions are drawn from self-reflection.</li> <li>- Good analysis: there is reflection on errors and good solutions, which are correctly identified and justified using research resources.</li> <li>- In general, the reflections are correct.</li> </ul>	<ul style="list-style-type: none"> <li>- Detailed conclusions are drawn from self-reflection.</li> <li>- Very good analysis: there is reflection on errors and good solutions, causes are correctly identified and justified using research resources.</li> <li>- Justified solutions are proposed.</li> </ul>	<ul style="list-style-type: none"> <li>- Excellent conclusions are drawn from self-reflection.</li> <li>- Suggestions for application to further translations are included.</li> <li>- Excellent analysis: there is reflection on errors and good solutions, causes are correctly identified and justified using research resources.</li> <li>- Justified solutions are proposed.</li> </ul>
<b>Use of resources</b>	<ul style="list-style-type: none"> <li>- No evidence of research or use of resources.</li> <li>- Resources are incorrectly cited.</li> </ul>	<ul style="list-style-type: none"> <li>- Some research resources are used, but not systematically.</li> <li>- Resources are not always well chosen.</li> </ul>	<ul style="list-style-type: none"> <li>- Resources are generally appropriate and used systematically, with a few exceptions.</li> <li>- Citations are incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>- Resources are reliable, relevant and used systematically.</li> <li>- Citations are correct.</li> </ul>	<ul style="list-style-type: none"> <li>- Resources are reliable, highly relevant and used efficiently.</li> <li>- Citations are correct.</li> </ul>

Source: Author

### Psychometric questionnaire

At the end of the semester, the students were asked to respond anonymously to a five-factor psychometric questionnaire as a final assessment task. The questionnaire was not intended as a general scale of translators' self-efficacy in the sense of Bolaños-Medina

& Núñez (2018), but as a more specific questionnaire structured around the following five factors:

- Factor 1: General self-efficacy statements;
- Factor 2: Process-related statements;
- Factor 3: Research abilities;
- Factor 4: Usefulness of self-reflection;
- Factor 5: Translation problems, errors and good solutions.

The questionnaire was aimed at assessing to what extent the participants felt more capable of performing specific tasks and to what extent self-reflection had helped them improve their self-awareness of translation problems and errors and their self-efficacy to perform specific tasks. The questionnaire comprised a total of 35 statements that students assessed using a five-point Likert scale ranging from “strongly disagree” to “completely agree”.

### **Data analysis**

To quantify the degree of correspondence between initial self-perception and initial self-performance, we compared the responses to the diagnostic assessment questionnaire and the results of the diagnostic assessment translation, measured in terms of number and category of errors.

To measure the progress of students, two variables were considered: the number of errors marked in each translation by the educator and the scores of the three self-reflection reports for the three years considered. Descriptive statistics were used to analyse both variables, namely: mean number of translation errors marked by the instructor in version 1 of each translation and mean number of errors per type of error. To neutralize the effect of text length, the number of errors per 100 words was calculated for every type of error, translation assignment and year.

For the analysis of data pertaining to the self-reflection reports for assignments A1, A2 and A3, the scores for each criterion included in the rubric were homogenized by assigning an unweighted score to each performance level, from 1 to 5. The evolution of students' performance was measured by calculating the mean and mode for the scores obtained for the three components during the three years, as well as the differences between the scores for A1 and A3.

Finally, a five-point Likert scale questionnaire was used to measure the perceptions of students with regard to the improvements in their performance as scientific translators throughout the semester. Respondents specified their level of agreement to the 29 statements contained in the questionnaire according to the following scale: (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree. To assess the evolution of self-awareness, the mean, mode and standard deviation for the answers was found and compared to the results of the analysis of the actual academic performance of students.

## **Results and discussion**

In this section, we present and discuss the results of our study, divided into three blocks: diagnostic assessment, evolution of students' performance and self-efficacy beliefs.

### **Diagnostic assessment**

#### *Diagnostic assessment questionnaire*

The results of the diagnostic assessment questionnaire are presented below, organized into three categories: translation habits, perceived translation problems and revision and perceived translation errors.

a. Translation habits

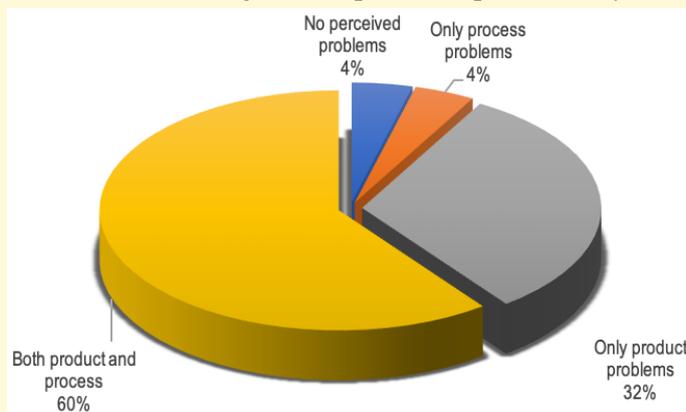
According to the results of the questionnaire, 92% of students read the source text before translating it and 80% claim they make sure they understand the text. In contrast, 20% of students do not usually analyze the source text and only 5% of students analyze the source text in search of possible translation problems or difficulties, whereas most students analyze text type, function and audience.

As regards documentation habits, 50% of students never search for information related to the topic of the text or to the relevant phraseology in order to make informed decisions and almost 80% of students make unplanned searches while translating texts. Actually, only 43% of students search unknown words, terms or concepts before translating the text. These findings suggest a deficient preparation phase focused on isolated items and a limited global awareness of the process, in agreement with Mellinger (2019).

b. Perceived translation problems

The 18 categories of problems mentioned by the participants in the study were divided into two broad categories: problems related to predetermined aspects of source texts conceived as products (hereinafter called 'product problems'), and problems related to the translation process or translation actions (hereinafter called 'process problems'). Most students reported having both product and process problems. However, 40% of students showed no awareness of having process problems and 15% of students mentioned only broad categories of problems, such as language, culture or terminology, without relating the cited categories with any type of translation procedure, which could be indicative of a lack of metacognitive bundling and, consequently, of limited translation competence.

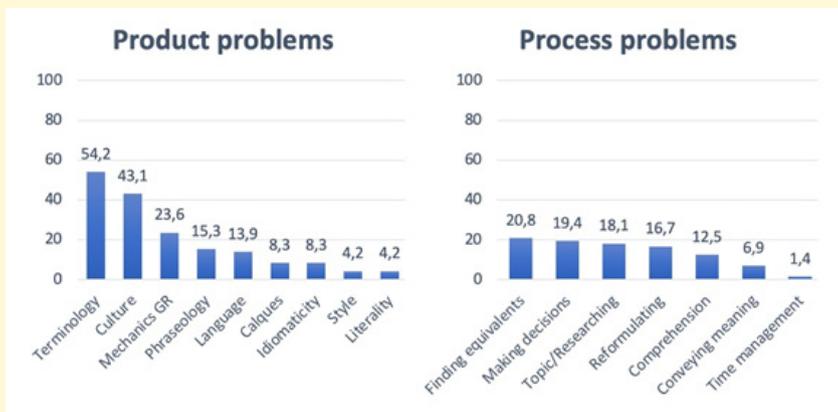
**Figure 5:** General categories of problems perceived by students



Source: Author

From among the 18 specific categories mentioned by the students, each student reported problems pertaining to only 1,7 categories on average, being 2 the mode for product problems and 1 for process problems, which could be due to low self-awareness or unrealistic self-efficacy beliefs.

**Figure 6:** Types of problems identified by students when translating



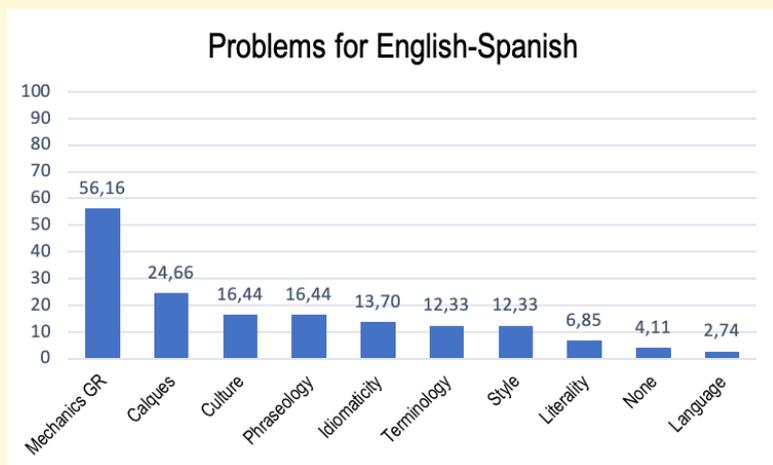
Source: Author

The most common product problem perceived by students was terminology, followed by cultural references. The high percentage of students who reported having terminological problems (54%) is in agreement with the findings of Mellinger (2019) for medical translation and could be due to low self-confidence caused by the lack of expert knowledge, in line with Hjort-Pedersen & Faber (2009) and Haro-Soler (2019a), but also to the poor documentation habits revealed by the responses to the questionnaire.

Mechanics and grammar were perceived as problems by 24% of students, and language in general was perceived as a problem by 14% of students. Interestingly, none of the students who declared having “language problems” responded affirmatively to the question related to the analysis of the linguistic characteristics of source texts. Despite being supposedly aware of having language problems, they do not analyze the text in search of potential language problems, which will probably lead them to making language errors. Accordingly, learning strategies must be developed to help them establish the relevant relationships between problems and strategies in order to reach metacognitive bundling and develop realistic self-efficacy beliefs.

As per process problems, the most common problem was finding equivalents, which is partially in agreement with the results for product problems; followed by decision-making, particularly about the selection of the most appropriate term. Actually, 25% of the students who declared having terminology-related problems affirmed having problems related to finding equivalents and decision-making, which suggests metacognitive activity in this small group of students. Yet, only 18% of students are aware of having research-related problems and 18% are aware of having difficulties in choosing the right term. In contrast, 51% of students did not mention any problems related with these processes, which could be indicative of insufficient awareness of their importance for successful strategy selection. Insufficient self-awareness can lead to these problems going unnoticed, and consequently, to wrong translation decisions.

**Figure 7:** Specific categories of problems perceived by students for the English-Spanish language pair



Source: Author

Our analysis of the specific problems mentioned by students for the English-Spanish language pair reveals a clear prevalence of mechanics and grammar, followed by calques, which is in agreement with a product-oriented education based on contrastive linguistics. Actually, process problems disappear for the English-Spanish pair. Interestingly, the percentage of students who perceive calques as a problem in this language pair multiplies by three as compared to calques perceived as a general translation problem, though not reaching even 25%. As compared to general translation problems, mechanics and grammar, calques and idiomaticity increase in relevance, while culture, terminology and general language problems sharply decrease.

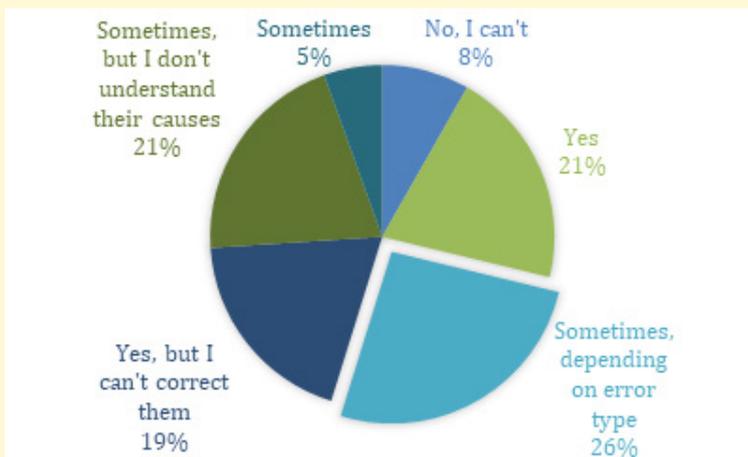
c. Revision and perceived translation errors

When asked about their revision habits, 60% of students declared revising texts more than twice before submitting their

translations (they allegedly revise content and style) whereas 40% declared performing only a stylistic editing of the draft version before submitting the translation. As regards the use of research resources during revision, 43% of the students declared using research resources during the revision, whereas 43% of the students declared carefully reading the text but not making queries. The percentage of students who only read the text is in agreement with the percentage of students who perform only a stylistic revision.

Despite the above revision habits, only 21% of students are sure of being able to spot and correct their own errors, while 52% detect errors only sometimes, and 19% feel they are able to spot their own errors but unable to correct them. Actually, almost 80% of students perceive they would be unable to successfully revise and correct their own translations. Because translation problems are closely associated with translation errors and the use of strategies (Hurtado Albir, 2011), error detection and categorization must be improved through reflective practice in order to improve awareness of problems and strategies.

**Figure 8:** Ability to spot and self-correct translation errors



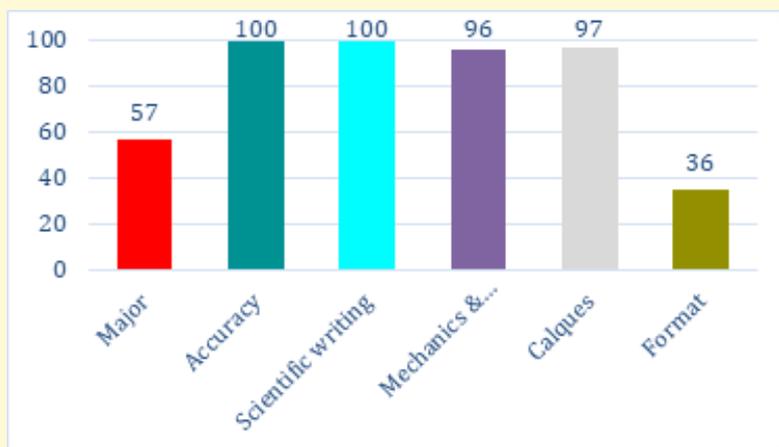
Source: Author

In brief, the diagnostic assessment questionnaire revealed deficient metacognitive bundling mainly due to the difficulty to associate problems with procedures and to the weak preparation of the translation assignment, particularly in three areas: identification of potential problems, documentation and identification of appropriate translation procedures.

### Diagnostic assessment translation assignment

To compare students' self-efficacy beliefs with their actual performance at the beginning of the semester, we analyzed performance in terms of the number and category of errors in assignment A0, based on the six categories used to mark errors in assisted revision and on the assumption that errors are indicative of problems or difficulties.

**Figure 9:** Incidence of errors among students in assignment A0



Source: Author

As shown in Figure 9, the actual performance of students clearly deviates from their self-perceptions. From among the 6 specific categories shown in Figure 9, each student made errors pertaining

to 4,87 categories on average, being 5 the mode, which clearly deviates from the 1,7 problem categories reported by students. Major errors comprised omissions and contresense, while accuracy comprised poor use of terminology and errors related with meaning deviations. Thus, as compared to the perceptions of students in regard to their ability to convey text meaning (only 7% of students were aware of having this problem), their actual problems in this key area for successful translation were much more serious. Actually, 100% of students made accuracy errors, with 41% of students omitting information and 5% making contresense, which seriously affected the meaning of the translated text.

Deviations were also observed for mechanics and grammar and calques, which affected more than 95% of students, as compared to 50% and 25% of students, respectively, who were aware of having problems related to these categories. Scientific writing errors, also related to the proper use of language, were made by 100%, an expected result at the beginning of the semester.

Finally, deviations were observed even for the format category, which affected 36% of students, even though this type of error was not even mentioned in the diagnostic assessment questionnaire, which suggests a lack of awareness in this area. The impact of the categories accuracy, mechanics/grammar and calques, which show the largest deviations from students' beliefs, is strong, insofar as these errors account for 63% of the total errors made by students.

The results suggest that students perceive a series of predetermined or fixed problems independent of the text to be translated but are not aware of other difficulties on the source text, mainly because of the type of analysis conducted and of poor revision habits, which lead them to making errors, particularly related to meaning, and is indicative of insufficient self-awareness and unrealistic self-efficacy beliefs. This could be explained by the predominant "product-oriented" approach in current translator education, which trains students to identify predetermined problems or "objective features" that can be recognized through a text analysis of the source and final texts, neglecting the problems

related to their individual characteristics (Lachat Leal, 2003) or to the procedures required to translate and revise. Likewise, the results reveal poor self-efficacy beliefs in terms of revision and error correction, with large uncertainty in their responses, which is indicative of insecurity and lack of self-confidence in their performance as revisers. Nevertheless, the perceptions of students in this area are more realistic and correspond better to their habits.

### **Evolution of students' performance**

To assess the actual performance of students, we analyzed the evolution of the number of errors in each translation assignment and the evolution of the academic scores of students.

### **Evolution of the number of errors**

The evolution of the number of errors marked in the diagnostic translation and in version 1 of assignments A1, A2 and A3 was analyzed for the three study years.

**Table 3:** Evolution of number of errors in version 1 of assignments A0 to A3

Type of error	A0	A1	A2	A3	Increase rate from A0 to A3
<i>Major errors</i>	0,42	0,53	0,33	0,31	-26,19%
<i>Accuracy</i>	3,61	5,04	2,65	1,96	-45,71%
<i>Scientific writing</i>	3,49	5,82	1,96	1,46	-58,17%
<i>Mechanics</i>	1,35	1,20	0,33	0,81	-40,00%
<i>Calques</i>	1,91	1,62	0,71	0,76	-60,00%
<i>Format</i>	0,14	0,44	0,45	0,14	0,00%
<b>Total mean</b>	<b>10,91</b>	<b>14,49</b>	<b>6,42</b>	<b>4,40</b>	<b>-59,67%</b>
<b>Standard deviation</b>	<b>7,21</b>	<b>5,16</b>	<b>2,56</b>	<b>3,42</b>	<b>-52,57%</b>

Source: Author

The percentage of errors made by students in versions 1 of their translations showed a clear downward trend, with a decrease by 60% from the diagnostic assessment translation to version 1 of A3, which is an outstanding result for a 9-week period, particularly considering the increasing level of difficulty of the texts. By category, errors specifically related to scientific translation accounted for the majority of errors (71%) in the first versions of translations, an expected result at such an early time within the semester. Yet, these errors halved from diagnostic assessment to A3, which is an encouraging result. Calques experienced the most remarkable decrease (60%), which suggests a potential increase in students' awareness, whereas format was the only category that remained stable throughout the semester.

As shown in Table 3, the means and standard deviations of the data largely varied among assignments. The large variability in the data for the first assignments could be indicative of different starting points for the participants, which progressively converged with the acquisition of the competences for the module. Actually, the value of standard deviation almost halved from A0 to A3. The lowest standard deviation corresponded to A2, which was a group assignment. The distribution of errors per type remained stable throughout the semester.

Overall, the progress of students as regards the number of errors made in the first versions of the translations was excellent, which suggests that assisted-revision and reflective practice actually helps students improve their ability to recognize problems and minimize errors, select and use the appropriate external resources, and provide solutions to problems. Following the analysis of the results for the number of errors, the results for the evolution of the rubric scores for the self-revision reports are presented in the next section.

### **Evolution of self-reflection report scores**

Table 4 summarizes the scores for the three components of the self-reflection reports.

**Table 4:** Evolution of means and modes for self-reflection reports for A1 to A3

	A1		A2		A3		Increase rate from A1 to A3	
	Mean	Mode	Mean	Mode	Mean	Mode	Mean	Mode
Context	2,39	2	3,08	4	3,14	2	31%	0%
Reflection	2,31	2	3,33	3	3,06	5	32%	150%
Use of resources	2,31	2	3,59	5	3,22	5	39%	150%

Source: Author

On average, none of the components obtained a mean score of strong or standard, although all the components reached the acceptable level in A3. Yet, the analysis of the modes for the three components reveals that the standard level was the most frequent score for reflection and use of resources, with 150% increase from A1. Actually, the evolution of mean scores from A1 to A3 was positive for all the criteria, with upgrades from deficient to acceptable in all the components and increases by 30-40% in all the mean scores. The performance of students improved most for A2, which was a group assignment, except for the contextualization item. Based on the results for the means of all the study years, cooperative learning apparently leads to an improvement in reflection, research tasks and translation revision, which is in agreement with the findings of Krogstie & Krogstie (2016) on the impact of the collective self-efficacy on individual reflection. A brief analysis of the evolution of the scores for each of the components of the self-report is presented.

**Context:** the ability of students to contextualize the text and anticipate translation problems improved steadily. In A1, there was no evidence of problem anticipation in self-reflection reports, whereas in A2 and A3, some translation problems were anticipated as a result of the analysis of the context of situation, which was correctly applied to the translation.

**Reflection:** the results for the self-reflection component of the report were very good, with a peak increase of 1,02 points in A2, the group assignment. Most students drew some conclusions from self-reflection, correctly identified the sources of errors or good solutions, and justified the solutions proposed. Yet, at this level, no suggestions were made for future applications of the conclusions to other translations, which could be detrimental to self-efficacy, as claimed by Krogstie & Krogstie (2016).

**Use of resources:** the best evolution corresponded to the use of resources. Actually, 33% of students reached the standard level and 16% reached the strong level in A3, in contrast with 7% and 13%, respectively, in A1. In practice, 57% of students systematically used appropriate resources and were able to cite them correctly, and 33% of students were able to select and use highly relevant resources in an efficient manner. Yet, almost 20% of students did not use any resources for justifying their errors or good solutions and based their reflections mostly on classroom comments.

In general, the scores for all the components of the method showed a good evolution, with reflection and use of resources contributing most to the improvement of students' performance.

### **Self-awareness and self-efficacy beliefs**

Table 5 summarizes the results of the psychometric questionnaire, which were analyzed based on the mean, mode and standard deviation for each statement. The results of the questionnaire were compared with the evolution of the actual performance of students to verify whether students developed realistic beliefs.

**Table 5:** Results of the psychometric questionnaire

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**Factor 1: General self-efficacy statements.**

*After having translated six texts, and having written three revision reports....*

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Item	Mean	Mode	SD
I am better able to translate scientific and technical texts.	4,33	4	0,66

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I have improved my ability to justify my translation decisions.	4,05	4	0,74
I am more reflective.	4,14	4	0,75
I am more efficient, <i>i.e.</i> I have achieved a good ratio between the time I spend on translation and the acceptability of my solutions.	3,71	4	0,56
<b>Total mean</b>	<b>4,05</b>		

**Factor 2: Process-related statements.**

*About the translation process, I would say that...*

I have introduced changes in my translation process.	4,24	5	0,89
I spend more time preparing the text.	4,05	4	0,80
I see more clearly the relationship between the contextualisation of the text and the way I approach the translation.	3,95	4	0,74
I spend more time understanding the source text.	4	5	1
I spend more time translating.	3,86	3	0,85
I reflect more during the translation process in order to make an appropriate decision.	4,33	4	0,66
I spend more time revising.	3,90	4	0,94
I distribute my time more evenly between text preparation, translation and proofreading.	3,67	4	0,73
I am more aware of the translation strategies I should use in each case.	3,95	4	0,59
<b>Total mean</b>	<b>3,96</b>		

**Factor 3: Research abilities.**

*As far as my documentation skills are concerned, I can say that...*

I have improved my documentation skills for specialised translation.	4,38	4	0,59
I have improved the procedure for selecting sources.	4,05	4	0,67
I have improved my procedure for using sources.	4,05	4	0,59
I make more efficient use of research sources, <i>i.e.</i> I use a limited number of sources, but more productively (I get more out of each source).	4,19	4	0,75
<b>Total mean</b>	<b>4,17</b>		

**Factor 4: Usefulness of self-report.**

*On the review report I have to say that...*

It has helped me improve my translation process.	3,76	4	1
It has helped me improve my translations.	3,90	4	0,83
It has helped me relate theory and practice.	3,95	4	1,02
It helps me to be more aware of what I learn.	3,95	4	0,80
I understand better why I make the mistakes I make.	4	4	0,71
Total mean	<b>3,91</b>		

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**Factor 5: Translation problems, errors and good solutions.**

*Let's move on to the last block: on translation problems, errors and successes, I think...*

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I have improved my ability to anticipate translation problems in the text preparation phase.	3,90	4	0,62
I have improved my ability to recognise the errors I make during the revision of the text.	3,86	4	0,79
Knowing my particularly good solutions has helped me improve the translation process.	4,14	4	0,85
Knowing my particularly good solutions has given me confidence.	4,10	5	0,89
Colour coding has helped me to better identify the mistakes I make when translating.	4,33	5	0,86
Today, I would be able to identify some of my mistakes without the help of colour coding.	3,62	4	0,67
In general, I make fewer errors.	4,05	4	0,59
Total mean	<b>4</b>		

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Source: Author

The results obtained from the psychometric questionnaire, with a mean of 4 for all the factors considered as a whole, suggest that students consider that their abilities to perform the tasks required to effectively translate scientific and technical texts and to self-report have improved, which is in agreement with the good results obtained for actual performance. Such a correspondence of results is indicative of improved general self-awareness.

For general efficacy statements, the poorest score corresponded to students' beliefs about translation efficacy (3,71), understood

as the relation between solution acceptability and the time spent in the process (PACTE, 2019). In this case, 65% were sure or very sure of having improved their efficacy whereas 35% of students were not quite sure. Actually, this perception was confirmed by their responses to process-related statements, specifically to the questions related to the time devoted to the different translation stages, which suggest that students generally tend to devote more time to every stage in the translation process by the end of the semester, but are not capable of reaching a good distribution of time. For process-related statements, the best results corresponded to concurrent reflection, aimed at making appropriate decisions, and to awareness of the appropriate translation strategies (4,33), which apparently confirms the beneficial effects of reflective practice and constructive feedback on self-efficacy and learning found by authors such as Atkinson (2014), Atkinson & Creeze (2014), Krogstie & Krogstie (2016) or Haro Soler (2019b).

The highest mean score was observed for Factor 3, related to the research abilities of students. Students perceived that they were more efficacious in all the items related to the documentation skills for specialized translation and felt that they used research resources efficiently. The agreement between the results for self-efficacy beliefs in this area and the actual performance of students suggests that the research tasks included in the pedagogical method used contributed to improving self-awareness. Such correspondence becomes even more significant given the increase in the difficulty of the source text for A3, which was more complex in terms of text readability and of the extralinguistic knowledge required to correctly understand the text.

The responses to the questions about the usefulness of the self-report showed larger variabilities, as suggested by the higher standard deviation values. In this case, the increase in the variability of responses was due to a larger occurrence of extreme scores. Specifically, highly variable values were found for items 18 and 20, related to the usefulness of the self-reflection report to improve the translation process and to relate theory and practice. Thus,

15% of students considered that the self-revision report did not help them improve their translation process and 40% of students found that the effort required to perform the report was excessive as compared to their learning. These results suggest the need to incorporate some measures to help less confident students improve their performance. In contrast, 75% of students perceived that self-reflection helped them improve their translations and 80% believed that the self-reflection report made them more aware of what they learned and why they made errors. Finally, 70% of students claimed that being aware of their good decisions enhanced their self-confidence and 90% of students believed that they made fewer errors and that color coding helped them identify and categorize errors, which is in agreement with their actual performance.

Finally, the questionnaire included an open-ended question about the types of error, which revealed that students considered that they committed fewer errors of the following types: errors related to the goals of scientific writing (45%), accuracy errors (21%), grammar errors (14%), calques (9,5%) and major errors (9,5%), which also corresponds to a great extent to their actual performance. These results support the findings reported by Mellinger (2019) for medical translation, according to whom problem recognition and solution evaluation can be developed by designing tasks that increase self-awareness.

## **Conclusions**

The results of this preliminary study suggest that, overall, the assisted revision and self-reflection method implemented in one module of scientific and technical translation during three academic years has helped students enhance the two components of self-efficacy: their actual performance as scientific and technical translators and their self-efficacy beliefs. The improved correspondence between both components by the end of the semester as compared to the poor correspondence found at the beginning of

the semester suggests that assisted revision and reflective practice have enhanced the awareness of students of their own problems and errors and have helped them develop realistic self-efficacy beliefs. Actually, a strong relationship was found between the scores observed for self-reflection reports and the perception of students on their ability to reflect on errors and good decisions and to justify their translation decisions. This is particularly true for the perception of the decrease in the number of errors related to scientific writing goals and the use of resources for specialized translation, which suggests a stronger self-awareness of the importance of the mastery of scientific writing and research skills to compensate for the lack of subject knowledge and limited experience in scientific translation or writing. Actually, in self-reflection reports, most of the reflections aimed at future translations were related to resource use.

Despite these results for the efficacy of the assisted revision and self-reflection method in helping students identify and minimize problems and errors, categorize errors, improve the use of resources, identify their strengths and justify errors and good solutions, some adjustments are needed to correct the detected drawbacks, namely the strong effort required to perform the tasks and the difficulties in transforming the good results of self-reflection into an efficacious translation process. The first drawback could be tackled by introducing more group work, which has actually produced the best results and could relieve some of the individual burden of the assignments. The second drawback requires a deeper analysis in order to fully understand the causes for these difficulties.

The results for the usefulness of color coding suggest the need for a more detailed analysis of this factor and of its role in the increased awareness of students of their own problems and errors and enhanced self-efficacy. An experimental study has been designed and is currently under way to verify the relevance of color coding in the pedagogical method used.

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