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# Why translator competence in information searching matters: An empirical investigation into differences in searching behavior between professionals and novice translators

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**Abstract**

*ISO17100 defines the "professional competences of translators," five skills required to be a professional translator. One of the skills described relates to translators' "research competence," which can be defined as searching skills pertaining to the additional linguistic and specialized knowledge necessary to understand the source language content and to produce the target language content. This paper presents a detailed investigation into this competence by comparing professional and novice translators' online searching behaviors during translation using both quantitative and qualitative measures. The authors asked five university students and four professional translators to translate the same source text. As they translated, their searching behaviors on the computer screen were recorded for quantitative analysis. Retrospective interviews were also conducted to identify the motivation of each search activity for the purposes of qualitative investigation. The results of the analysis show that the time spent on searching, the content of search queries, and the number of websites visited for a given search all differed significantly between professionals and students. The interviews suggest that those differences may arise from varying motivations for searching, motivations that fall into three categories: 1) seeking information that is as reliable as possible, 2) understanding context, and 3) avoiding mistranslation.*

## 1. Introduction

Becoming a professional translator entails developing a distinct skillset. The European Master's in Translation (EMT) Competence Framework 2017 provides 35 detailed items for translators-in-training to acquire over the course of their graduate

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program in translation. ISO 17100 (2015, p. 6) broadly defines professional translators as demonstrating five essential competences: a) linguistic and textual competence in the source and target languages; b) competence in research, information acquisition, and processing; c) cultural competence; d) technical competence; and e) domain competence. This delineation of competences, openly shared among the translation/localization industries, is, on one hand, useful to the extent that it provides a framework for successful translation training. On the other hand, the competence descriptions are vague. Concerning "research competence," for instance, ISO 17100 reads:

> Competence in research, information acquisition, and processing: the ability to efficiently acquire the additional linguistic and specialized knowledge necessary to understand the source language content and to produce the target language content. Research competence also requires experience in the use of research tools and the ability to develop suitable strategies for the efficient use of the information sources available (p. 6).

The lack of granularity as to exactly what the "suitable strategies" are leaves student translators with ambiguous targets for learning. This perspective informs one of the authors' aims in this study: to describe more precisely the components of professional translation competence – specifically, competence in research, the searching skill.

Searching is considered one of the most important skills in translation as it involves complex cognitive activities such as information-processing and constant decision-making, among others (Enríquez Raído, 2013). Enríquez Raído (ibid.) argues that, since translators work with diverse subjects and text types, it is essential that student translators develop information-mining skills applicable to any field.

The present research focuses on online "searching skills" and identifies specific searching behaviors of qualified professional translators who meet the ISO 17100 standards. The researchers in this study have assumed that professional translators exhibit skilled searching behaviors during the translation process that can be captured by established translation process research methods. In order to differentiate professional from novice behaviors, the study was designed to compare the searching performance of professional and student translators.

## 2. Empirical Investigations into Searching Competence

Translation competence in general is a central concept in translation studies according to leading researchers such as Schäffner, Nord, Alves, and Ehrensberger-Dow; however, the number of studies that empirically investigate the components of competences, including searching competence, is limited.

Enríquez Raído (2013) observed and analyzed searching behaviors of student translators and found that participants skilled at using search engines spent more time searching online during translation and produced higher-quality translations than did less skilled participants. The more successful translators performed more non-dictionary website searches than dictionary-based searches and spent more time searching overall [i]than those who produced poorer translations did. These findings suggest that one of the specific research behaviors associated with professional translation is greater depth of searching that depends more heavily on non-dictionary websites.

Enríquez Raído (2013) also found a relationship between translation quality and the amount of background research, that is, research that does not involve lexical searches and complements a lack of familiarity with the topic of the source text. In Enríquez Raído's study, the trainee who produced the best translations was interested in background information and spent the longest time researching it.

Paradowska (2015) analyzed students' web searching skills before and after a four-month intervention. The students were enrolled in a three-semester undergraduate translation course in western Poland. The research questions the author addressed are whether and how the professional searching skills developed by the students influenced their search speed and accuracy. As expected, the participants showed improvement in their web searching performance. However, the number of successful searches failed to increase despite the fact that the participants followed desirable web searching behavior patterns. These results indicate that the student translators were attempting to implement the web searching competency techniques presented by the instructor. However, at the same time, some participants did not learn searching skills as well as the rest of students, and overall they were nowhere near expert competence in terms of web searching accuracy.

Onishi et al. (2017) investigated the mechanism of mistranslation errors made by novice translators and its relationship with their general behaviors during the translation process. While the main cause of mistranslation errors was students' lack of target language knowledge, it was found that the translators who made the most errors had tried to match their translations to the target language register and context by searching for better translation choices. Detailed observation of each translator's behavior also revealed a distinction between the searching behaviors of the translators who exhibited errors due to elaborating their translation further and those of the rest of participants. These translators performed extended searches by looking up not only the dictionary definitions of words or phrases but also seeking out non-dictionary information in their translation decision-making process, considering holistic translation over simple word-for-word equivalencies. However, they ultimately failed to translate the word accurately. This pattern suggests that solutions to this problem among aspiring professional translators may

rest in developing effective searching strategies other than attention and second language knowledge.

Gough (2019) studied the translation-oriented research activities (TRAs) of 16 freelance professional translators during a translation task in their natural working environment. The investigation into their translation behaviors included identifying the type of resources used (i.e. dictionary, non-dictionary, etc.), research direction (i.e. query typed in the source or target languages), and research strategy (i.e. top-down, contextual vs. bottom-up, dictionary-based searches). The findings demonstrated that, although TRAs are complex, multidimensional, and idiosyncratic, certain behaviors can be systematized, a result that is relevant to translator trainers seeking to teach competences associated with information acquisition and utilization during the translation process.

In summary, when using different types of sources, translators with different levels of expertise exhibit different kinds of searching behaviors in terms of dictionary-based vs. non-dictionary-based sources, depth of searching, and frequency of utilizing background research (Enríquez Raído, 2013; Gough, 2019). To a certain degree, those skills can be taught to students through training, but accuracy in searching may not reach an expert level (Paradowska, 2015). Onishi et al. (2017) indicates the root causes of translation errors are largely lack of mastery in professional searching skills. The above studies indicate that while it is important for students to master expert-like searching competences, the training needs to demonstrate both *what* experts do and *why* they do it. To investigate this matter, both quantitative (as to what) and qualitative (as to why) analyses need to be carried out. Therefore, the present study aims to identify professional translators' searching behaviors and compare them with behaviors of translators with less expertise in the hope of contributing to the development of finer-grained descriptions of searching competence.

## 3. Research Questions

As described above, this study focuses on online search behaviors displayed by professional translators and student translators in the course of the translation process. Based on previous literature, various aspects of searching were measured both qualitatively and quantitatively in a holistic manner to identify expert search behaviors. To reveal these aspects of the translation process, the research question and sub-questions were formulated as follows.

> Main research question: How do translator web searching behaviors differ based on the level of expertise in translation? Do professional translators exhibit distinct web searching strategies from which translators-in-training can learn?

Differences in search strategies between professional and novice translators were quantified as time spent and resources used, yielding sub-question 1.

> Sub-question 1: How do the amount of time researching and the type of sites used differ between professional and novice translators?

The amount of time, or "search session," was operationalized as the portion of the entire translation process spent researching online (Enríquez Raído, 2013). Categorization of website types used were based on Onishi et al. (2017). On top of these measures, more specific actions were investigated for this sub-question, including the frequency of source-oriented or target-oriented searches and the number of "jumps" from the search engine results. Based on findings from previous literature, it was hypothesized that quantitative differences in search behaviors would be observed based on level of expertise.

Additionally, potential differences in information-gathering strategies were explored qualitatively by investigating the translators' motivations behind their search behaviors.

> Sub-question 2: Do professional and novice translators report different motivations for acquiring information to support their translation process, particularly in the area of conducting background research?

To answer this question, the quality of online searching among professionals and novices was observed. These data, along with the quantitative data addressing sub-question 1, were triangulated with excerpts from retrospective interviews with participants conducted after the experiment, assuming that professional translators have already acquired the searching competence.

## 4. Experiment Design

The participants in this study were five university students as novice translators and four professional translators. All of the students were English majors with advanced English proficiency (the least proficient had a TOEIC score of 810 while the most proficient had an IELTS Band score of 7.0). All had taken one or two courses in translation and interpreting offered in their university department. In that they had some experience in translation, they were considered novice translators.

As for the professional translators recruited for comparison, all had more than three years of work experience (with the most experienced having 28 years) in professional translation. Their specializations varied, ranging from IT manuals and technical documents

to non-fiction books.

The source text used in this study was an article originally from *Science* about the discovery of a dinosaur's color. Excerpted and edited, the text was shortened to 62 words to ensure that the participants could complete the task within an hour. The appropriateness of the translation task, including the time allotted to complete the task, was evaluated through a pilot study: asking a student who had also taken translation courses and a professional translator to translate in the experiment setting, and calculating the time spent.

Prior to performing the translation task, participants were given instructions about the task and the content of the study, and signed a consent form. Participants could elect to complete an additional paper-based questionnaire about their English ability (for the student translators) and work experience and specialties (for the professional translators).

The test process was basically the same as in Onishi et al. (2017), comprising a translation task and a retrospective interview that were expected to take approximately two hours total. For the translation task, participants were asked to translate the text without a time limit. All participant actions on the PC were recorded with the software BB FlashBack Pro. After finishing their translation, participants watched the video recording with the experimenter and were interviewed about their translation process, with a focus on research strategies.

## 5. Data Collection and Methods of Analysis

### 5.1 Data collection: BB FlashBack Pro

In this study, BB FlashBack Pro was utilized to collect recording data that then served as a stimulus for retrospective interviews. Unlike Translog, the software is not exclusively designed for the translation process, but it has an established use in translation-process research (Yamada, 2011; Enríquez Raído, 2013). This software can record participants' behaviors on the PC, including keylogging, mouse clicks, and cursor movements with timestamps. All collected data can be exported into a Microsoft Excel file (Figure 1), to which the authors added sub-categories of searching behavior such as typing, deleting, modifying, pausing, and searching to timestamps.

| phase | timestamp | keylog | Type | diff | diff_type | mouse | place | time_spent_ | behaviour | detail 1 | detail 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| draft | 0:11:38 | e | type | | | | word | | | | |
| draft | 0:11:38 | r | type | | | | word | | | | |
| draft | 0:11:39 | ひらがな | type | | | | word | | | | |
| draft | 0:11:39 | g | type | | | | word | | | | |
| draft | 0:11:39 | a | type | | | | word | | | | |
| draft | 0:11:39 | Ret | type | | | | word | | | | |
| draft | 0:11:41 | ArwUp | | | | | word | | STへ移動 | | |
| draft | 0:11:41 | ArwUp | | | | | word | | STへ移動 | | |
| draft | 0:11:41 | ArwUp | | | | | word | | STへ移動 | | |
| draft | 0:11:41 | ArwUp | | | | | word | | STへ移動 | | |
| draft | 0:11:41 | ArwUp | | | | | word | | STへ移動 | | |
| draft | 0:11:42 | ArwUp | | | | | word | | STへ移動 | | |
| draft | 0:11:42 | ArwUp | | | | | word | | STへ移動 | | |
| draft | 0:11:42 | ArwUp | | | | | word | | STへ移動 | | |
| draft | 0:11:42 | ArwUp | | | | | word | | STへ移動 | | |
| draft | 0:11:43 | ArwRght | | | | | word | | copy | paleontologistをcopy | |
| draft | 0:11:43 | Ctrl | | | | | word | | copy | paleontologistをcopy | |
| draft | 0:11:43 | [Ctrl]+[Shf] | | | | | word | | copy | paleontologistをcopy | |
| draft | 0:11:43 | [Ctrl]+[Shift]+[ArwRght] | | | | | word | | copy | paleontologistをcopy | |
| draft | 0:11:44 | [Ctrl]+[C] | | | | | word | | copy | paleontologistをcopy | |
| draft | 0:11:45 | | search | | | click | chrome | | chromeへ移動 | | |
| draft | 0:11:45 | Ctrl | search | | | | chrome | | paste | paleontologistをpaste | |
| draft | 0:11:46 | [Ctrl]+[V] | search | | | | chrome | | paste | paleontologistをpaste | |
| draft | 0:11:46 | Ctrl | search | | | | chrome | | paste | paleontologistをpaste | |
| draft | 0:11:46 | [Ctrl]+[A] | search | | | | chrome | | paste | paleontologistをpaste | |
| draft | 0:11:46 | [Ctrl]+[V] | search | | | | chrome | | paste | paleontologistをpaste | |
| draft | 0:11:46 | Ret | search | | | | chrome | | paste | paleontologistをpaste | |
| draft | 0:11:47 | | search | 0:00:11 | search | cursor | chrome | 0:00:11 | 検索結果のbrowse | | |
| draft | 0:11:56 | | | | | click | word | | wordへ移動 | | |
| draft | 0:12:00 | Ctrl | search | | | | word | | copy | Jakob Vintherをcopy | |
| draft | 0:12:01 | [Ctrl]+[C] | search | | | | word | | copy | Jakob Vintherをcopy | |
| draft | 0:12:01 | | search | | | click | chrome | | chromeへ移動 | | |

Figure 1. Sample of logging information on spreadsheet

### 5.2 Search session

This section defines search session based on Enríquez Raído (2013). A search session is a translator's series of search actions on the PC, including typing keywords into the search engine query box, browsing search engine results, and scanning or reading website content. The search session, as defined by the authors in the present study, starts when a translator leaves Microsoft Word to select a web browser application to look for the information and ends when they return to translating in Word. A search session is considered to continue if no distinctive actions that delimit the searching operation are observed. However, when it was clear that there were technical or operation-related problems, for instance the online connection being stuck, the time and the action were not counted as part of the search session. In addition, when a search session continued even though movements between the web browser and MS Word were captured, as when the translator checked the source text or searched other words before returning to the original searching, the actions were recorded as a single search session with the time spent on MS Word subtracted from the session time. Moreover, when a movement from MS word to web browser occurred after the previous search session had ended, but the aim of searching was unclear either from observation or from the interview, the movement was not counted as a search session. Hence, there will be some discrepancies between total search time and search session time.

While Enríquez Raído (2013, p. 364) stated that "session length […] was complemented by the number of online actions taken by the participants," this study does

not count “online actions.” Instead, the study counts steps using the indicator of a new page loading such as clicking a link to move away from a search engine results page to a specific linked website. Steps also include moving from one website to another and moving from a web browser to MS Word. However, jumps between or among pages on the same website page are not counted as additional steps.

### 5.3 Interview data

Interview data collected through retrospective interview was analyzed to reveal participants’ reasoning for their actions since quantitative data analysis does not provide information about each translator’s inner state. Precisely for this purpose, retrospective interview data were used to uncover some elements, including the participant’s motivation for searching, what type of information was sought, and why they took those steps in relation to the target text.

## 6. Results: Quantitative Analysis

### 6.1 Relation between total translation time and searching time

In response to sub-question 1 regarding quantitative aspects of the searches, this section describes the relationship between total translation time and searching time in students and professional translators. The authors’ assumption is that the results will confirm the findings of Enríquez Raído (2013), namely that participants with high web-searching expertise, which in this paper means professional translators, will spend more time on web searching during translation than participants with lower expertise, here referring to students. Hence, professional translators will exhibit extensive searching behaviors compared to students.

Table 1 shows participants’ total translation time including time spent on each of the three translation phases: pre(-drafting), draft, and post(-drafting) (for more on translation phases, see Jakobsen [2002] and Yamada [2011]). Table 2 shows searching time for each participant, indicating the time spent in each phase, corresponding to the three phrases in Table 1.

Students a through e were university students, and professional A through D were professional translators. Looking at each translator’s translation time in each phase reveals that individual participants seem to have their own approach to doing a translation. However, when the average total translation time in Table 1 is considered, it becomes clear that professional translators as a group took longer to complete the whole translation task with none of them taking less time than the students’ average. However, the difference in total average time is not significant (Wilcoxon signed-rank test: $W = 3$, $p > 0.05$).

When it comes to searching time, individual styles among the professionals again

emerge. Still, professional translators on average spent about twice as much time on searching as students on average. Specifically, professional translators on average took about nine minutes longer to complete their task (0:30:56 [pro] vs. 0:21:59 [student]) and about eight minutes longer on searching than students did (0:15:45 [pro] vs. 0:07:58 [student]). Thus, the difference in time spent searching accounts for most of the statistically significant difference in total translation time between the professionals and the students (Wilcoxon signed-rank test: $W = 1$, $p < 0.05$).

| | | pre | draft | post | total |
|---|---|---|---|---|---|
| Student | a | 0:00:42 | 0:09:22 | 0:01:18 | 0:11:22 |
| | b | 0:01:05 | 0:14:51 | 0:04:01 | 0:19:57 |
| | c | 0:03:46 | 0:16:55 | 0:01:39 | 0:22:20 |
| | d | 0:00:32 | 0:23:41 | 0:00:51 | 0:25:04 |
| | e | 0:03:10 | 0:23:20 | 0:04:41 | 0:31:11 |
| | Ave. | 0:01:51 | 0:17:38 | 0:02:30 | 0:21:59 |
| Professional | A | 0:01:57 | 0:15:57 | 0:07:07 | 0:25:01 |
| | B | 0:01:26 | 0:18:18 | 0:07:16 | 0:27:00 |
| | C | 0:11:57 | 0:15:54 | 0:08:14 | 0:36:05 |
| | D | 0:24:57 | 0:07:00 | 0:03:41 | 0:35:38 |
| | Ave. | 0:10:04 | 0:14:17 | 0:06:34 | 0:30:56 |

Table 1. Translation time of each participant

| | | pre | draft | post | total |
|---|---|---|---|---|---|
| Student | a | 0:00:12 | 0:03:10 | 0:00:19 | 0:03:41 |
| | b | 0:00:38 | 0:06:03 | 0:01:03 | 0:07:44 |
| | c | 0:02:33 | 0:06:15 | 0:00:00 | 0:08:48 |
| | d | 0:00:12 | 0:11:12 | 0:00:00 | 0:11:24 |
| | e | 0:01:38 | 0:06:35 | 0:00:00 | 0:08:13 |
| | Ave. | 0:01:03 | 0:06:39 | 0:00:16 | 0:07:58 |
| Professional | A | 0:01:00 | 0:07:43 | 0:01:49 | 0:10:32 |
| | B | 0:00:49 | 0:10:04 | 0:00:46 | 0:11:39 |
| | C | 0:07:48 | 0:07:32 | 0:05:24 | 0:20:44 |
| | D | 0:20:07 | 0:00:00 | 0:00:00 | 0:20:07 |
| | Ave. | 0:07:26 | 0:06:20 | 0:02:00 | 0:15:45 |

Table 2. Searching time of each participant

### 6.2 Websites visited and time spent

Most of the searches started with queries typed into a search engine. After that, participants visited other websites, sometimes modifying the contents of their query and searching again, or finished searching only after looking at a search engine results page. This section describes search behaviors with regard to website types visited, time spent on the visited site, and also time spent viewing search engine results pages.

Websites visited were categorized into three types for analysis: dictionary, non-dictionary, and search engine results. Taking the categories from Onishi et al. (2017),

websites were first sorted into dictionary websites and non-dictionary websites. In addition, some translators' searching behavior consisted only of browsing the search results, which was counted separately as a category of search engine.

Tables 3 and 4 show the types of websites each participant visited. They also indicate the time spent on the website or viewing search engine results pages along with the percentage of the total time spent in each category. The values in the Search Engine column represent the time spent viewing the search engine results, as mentioned above. Dictionary sites such as Weblio, Eijiro on the Web, Google Translate, and Eigo-box are categorized as dictionary websites, as they only provide lexical information. The following websites were considered to be non-dictionary websites: Wikipedia, National Geographic, Google Image, Logmi, the Page, Kyoryu-zukan (the Dinosaur Guide), Blog.etsuterm, How to Pronounce, Discovery, American Museum of Natural History, University of Bristol, and Nature Research.

"Original text" in the table represents the website of the original article from which the source text was taken. The URL of this original website was provided at the bottom of the task text so that participants could refer to it any time during their translation task. This website is also categorized as non-dictionary.

Non-dictionary websites such as Wikipedia, the Dinosaur Guide, and American Museum of Natural History describe biological characteristics of the dinosaur that appears in the source text of the task. Google Images, which could be thought of as a search engine, is also sorted under non-dictionary because the visual information retrieved does not contain descriptions provided by true search engine results pages. The rest of the non-dictionary websites are considered parallel texts because articles in those websites provide text style information as well as contextual information about the source text.

Comparing total searching time, the results show that the students on average spent 32.13% of their total searching on viewing search engine results while the professional translators spent a comparable 32.18%. Although time spent on search engine results is nearly the same for both groups, their search terms and information sought differed.

Looking at component percentages in Figure 1, the students' distribution of time between dictionary websites and non-dictionary websites diverged from that of professionals. The students spent 30.96% of their searching on dictionary websites whereas professional translators only expended 11.40%. Conversely, the professional translators spent over half of their search time (56.43%) on non-dictionary websites, while students engaged with non-dictionary websites for only 36.90% of their total search time. Although the professional translators used dictionary websites as frequently as the student translators, the students spent more time on each visit, resulting in dictionary websites occupying a greater proportion of their total searching time.

| Type of Website | Name of Website | Total | | | | | | Ave. |
|---|---|---|---|---|---|---|---|---|
| | | | a | b | c | d | e | |
| | | search total | 0:03:41 | 0:07:44 | 0:08:48 | 0:11:24 | 0:08:13 | 0:07:58 |
| Search engine | | | 0:03:01 | 0:02:08 | 0:02:39 | 0:03:48 | 0:01:12 | 0:02:34 |
| | | % (search engine/whole) | 81.90% | 27.59% | 30.11% | 33.33% | 14.60% | 32.13% |
| Dictionary | Weblio | | 0:00:40 | 0:00:01 | | | | |
| | Eijiro on the web | | | 0:01:39 | | 0:03:47 | 0:03:51 | |
| | Eigo-box | | | 0:00:45 | 0:00:32 | 0:00:44 | | |
| | Google Translate | | | | 0:00:21 | | | |
| | | total | 0:00:40 | 0:02:25 | 0:00:53 | 0:04:31 | 0:03:51 | 0:02:28 |
| | | % (dictionary/whole) | 18.10% | 31.25% | 10.04% | 39.62% | 46.86% | 30.96% |
| Non-Dictionary | Original text | | | 0:00:21 | 0:01:24 | 0:01:24 | 0:02:55 | |
| | Wikipedia | | | 0:01:36 | 0:00:27 | 0:01:06 | | |
| | National Geographic | | | | 0:02:57 | 0:00:35 | | |
| | University of Bristol | | | 0:00:04 | | | | |
| | Logmi | | | 0:01:10 | | | | |
| | Tow to Pronounce | | | | | | 0:00:15 | |
| | Google image | | | | 0:00:28 | | | |
| | | total | 0:00:00 | 0:03:11 | 0:05:16 | 0:03:05 | 0:03:10 | 0:02:56 |
| | | % (non-dictionary/whole) | 0.00% | 41.16% | 59.85% | 27.05% | 38.54% | 36.90% |

Table 3. Websites visited and time spent (students)

| Type of Website | Name of Website | Total | | | | | Ave. |
|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | |
| | | search total | 0:10:32 | 0:11:39 | 0:20:44 | 0:20:07 | 0:15:45 |
| Search engine | | | 0:03:53 | 0:06:30 | 0:06:40 | 0:03:14 | 0:05:04 |
| | | % (search engine/whole) | 36.87% | 55.79% | 32.15% | 16.07% | 32.18% |
| Dictionary | Weblio | | | | | 0:00:24 | |
| | Eijiro on the web | | 0:03:39 | | 0:03:08 | | |
| | | total | 0:03:39 | 0:00:00 | 0:03:08 | 0:00:24 | 0:01:48 |
| | | % (dictionary/whole) | 34.65% | 0.00% | 15.11% | 1.99% | 11.40% |
| Non-Dictionary | Original text | | 0:01:53 | 0:01:23 | 0:01:43 | 0:07:40 | |
| | Wikipedia | | | 0:02:01 | 0:01:42 | 0:01:29 | |
| | National Geographic | | | | 0:06:48 | 0:02:00 | |
| | University of Bristol | | | | 0:00:43 | | |
| | google image | | 0:00:14 | 0:01:10 | | | |
| | Discovery | | 0:00:16 | | | | |
| | Nature Research | | 0:00:37 | | | | |
| | American Museum of Natural History | | | 0:00:35 | | | |
| | The page | | | | | 0:03:40 | |
| | Kyoryu-zukan | | | | | 0:01:26 | |
| | Blog.etsuterm | | | | | 0:00:14 | |
| | | total | 0:03:00 | 0:05:09 | 0:10:56 | 0:16:29 | 0:08:53 |
| | | % (non-dictionary/whole) | 28.48% | 44.21% | 52.73% | 81.94% | 56.43% |

Table 4. Websites visited and time spent (professionals)

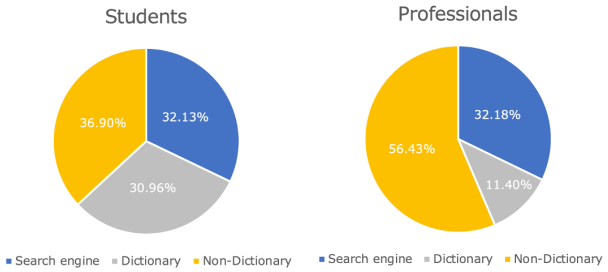


Figure 1: Percentage of time spent by website type

### 6.3 Number of search engine query box entries and types

In this section, search engine queries – what translators typed in the search engine and in which language – will be analyzed as evidence to supplement the aforementioned results.

The results of this analysis are shown in Table 5. The "entry into query box" column shows the total number of entries typed into query boxes by each participant. Comparing the students' average (7.4) with that of the professionals (9.3) shows that their use of the search engine in terms of the number of entries was almost the same with no statistical significance (Wilcoxon signed-rank test: $W = 7.5$, $p > 0.05$).

However, subcategorizing the query contents into source or target language reveals a different feature. The source language entry ("SL entry") column represents the number of participants' searches in the source language. For instance, a participant copies a word from the source text and pastes it directly into the query box. In contrast, when a participant types something in the target language into the query box while translating the source text, it is counted as a target language entry ("TL entry").

When the number of each entry type was compared, students showed a tendency to enter source language into the query box more frequently than target language, whereas professional translators entered target texts or related words with almost equal frequency to source words. This does not mean that professional translators did not perform SL entry searches. SL entry searches were performed by both novices and professionals, with no significant difference ($W = 14$, $p > 0.05$).

However, since professional translators searched in the target language more frequently, they may have found more information to support accurate target language renditions than students, whose TL entries on average comprised less than 11% of their search queries (0.8 out of 7.4 times). The difference of TL entry on average between students and professionals shows statistical significance (TL entry: $W = 0$, $p < 0.05$).

| | | entry into query box | SL entry | TL entry |
|---|---|---|---|---|
| Student | a | 11 | 11 | 0 |
| | b | 6 | 5 | 1 |
| | c | 7 | 5 | 2 |
| | d | 12 | 11 | 1 |
| | e | 1 | 1 | 0 |
| | Ave. | 7.4 | 6.6 | 0.8 |
| Professional | A | 8* | 3 | 3 |
| | B | 14 | 9 | 5 |
| | C | 9* | 3 | 5 |
| | D | 6 | 3 | 3 |
| | Ave. | 8.2 | 4.5 | 4 |

Table 5. Search engine query box entries and types

* Includes queries designed to open a dictionary website rather than search for a specific word, which are not sorted as SL entry or TL entry but still contribute to the total number of entries .

### 6.4 Jumps from search results to individual website

After typing entries in the search engine query box, participants visited various websites from the search result lists. The behavior analyzed in this section is the number of jumps from search engine results after query entry.

As shown in Table 6, the greatest number of jumps observed was three. One jump means that a participant typed the keyword into the query box of the search engine, saw the search engine results page, then clicked the hyperlink for a website shown on the results page. If the participant returned to the search result page after browsing that site and then opened another link to a different website from the same search results page, it would count as two jumps.

Looking at the number of jumps in Table 6, we can see that the students never jumped to more than one website from the search results page, except for Student c, who visited two websites in one of the searches. In contrast, all the professional translators jumped to more than two websites in one or more of their searches. Professional translator B and Professional translator D even visited three websites once. This result implies that professional translators look for more information than students during translation.

Considering the results in 6.2 and 6.3 pertaining to types of websites the professional translators visited, which show a large number of target-language oriented websites as well as dictionary sites, it is inferred that professional translators are concerned with information in the target language and may require more jumps to gather the proper information for selecting a suitable translation.

| | | 1 jump | 2 jumps | 3 jumps |
|---|---|---|---|---|
| Student | a | 1 | 0 | 0 |
| | b | 5 | 0 | 0 |
| | c | 4 | 1 | 0 |
| | d | 5 | 0 | 0 |
| | e | 1 | 0 | 0 |
| Professional | A | 4 | 1 | 0 |
| | B | 3 | 1 | 1 |
| | C | 3 | 1 | 0 |
| | D | 5 | 1 | 1 |

Table 6. Number of jumps from a search engine results page

### 6.5 Summary of quantitative analysis

To answer sub-question 1, "How do the amount of time researching and the type of sites used differ between professional and novice translators?", from the results of 6.2, which describes the types of websites translators visited, the types of websites used were found to be remarkably different among translators. First, the study categorized websites into three types: search engine results, dictionary, and non-dictionary. Despite the fact that students divided their time almost equally on each type, professional translators spent the longest time on non-dictionary websites and the shortest time on dictionary websites. This result suggests that professional translators spend more time on non-dictionary related websites than students.

Second, the results of 6.3, number of search engine query entries and types, and 6.4, jumps from the search engine, showed that the professional translators' search queries comprised a larger number of target-text oriented searches accompanied by more jumps to linked sites than were observed among students. That is to say, professional translators' searches were more intensive and concerned with target-text oriented information (non-dictionary websites) that also possibly led translators to find parallel texts by typing target text-related keywords into a query box.

The overall differences that have been captured in this section may be characterized as "shallow searching" vs. non-shallow searching. According to Nicholas et al. (2006, p.14), shallow searching "might suggest an unsuccessful, uninformed, or lazy form of behavior." In a shallow search session, users briefly look at a few items before they leave the page (Nicholas et al., 2004). Enríquez Raído (2013) investigated translators' search sessions, concluding that shallow searching "primarily involves easy, fast, and more or less cursory visits" (p. 393) to a few websites, mainly dictionary related websites, with short search session lengths. Given the data collected, a short length search session with few jumps (no more than three jumps in this case) can be categorized as a shallow search.

In contrast, non-shallow searching corresponds to a long search session with multiple steps, including non-dictionary websites or search engine results. When a translator engages with a website (excluding dictionary websites) for a long time, it is also

considered non-shallow searching.

In this study, the professional translators overall carried out non-shallow searching in terms of the time spent on the sites and the number of search sessions, whereas students tended to rely on shallow searching, easy and fast access to information.

## 7. Results of Qualitative Analysis: Interview data

### 7.1 Background Research

In addition to the quantitative analysis results explored above, we carried out a qualitative analysis of translators' searches to examine the motivations behind the translators' search behaviors. In response to sub-question 2, as to whether professional and novice translators report different motivations for acquiring information to support their translation process, particularly in the area of conducting background research, this section examines the interview data which were collected through retrospective interviews during which participants were asked about their motivations while watching the video recording of their own translation process. The interview data excerpts in Japanese are translated by the authors into English.

In order to reveal motivations other than finding out the meaning of words and expressions, the researchers decided to target the parts of the search sessions in which participants sought background information, the so-called "background research" (Enríquez Raído, 2013), which is a search session that does not involve lexical searches and complements a lack of familiarity with the topic (ibid.). In the analysis of the present study, background research is defined as searching for contextual information relevant to the source text (i.e., non-dictionary search), apart from lexical searches (dictionary search). Therefore, we focused on searching non-dictionary websites and search engine results as categorized in our study, and carried out interviews to obtain the qualitative data analyzed in the following sections. By doing so, we expect to elucidate translator's motivations and reasons as to *why* they carried out background research.

### 7.2 Background research process and reasons for the behavior

Before illustrating the detailed processes of searching performed and comments made by translators explaining the reasons for each background research, the main findings observed in professional translators' "strong motivations" for searches are summarized as follows: 1) translators seek the most reliable information by comparing multiple information resources, 2) they try to fully understand the original text in context, and 3) they take great care in avoiding mistranslation. To shed light on the first and second features, we focus on professional translators C and D, who conducted longer background research, and student c, who is the only student to have conducted background research.

### 7.2.1 Professional translator C

First, let us look closely at one instance of a search process, which represents background research particularly well, performed by professional translator C to determine the how to transliterate the proper name of a person mentioned in the source text, “Jakob Vinther.” Choosing any reasonable transliteration of the name in Japanese characters would be unlikely to be viewed as an error, yet professional translator C spent seven minutes over ten search steps to determine how this individual’s name could be accurately rendered in Japanese, the most of any participant.

Professional translator C started with reading the source text and then visited the Japanese *National Geographic* website, where a parallel text of the original text appeared. On her reasoning for visiting the website, professional translator C stated in the retrospective interview:

> I opened this website to check the name of this academic to see how it is spelled in Japanese. Before opening this Japanese website, I found several spellings for the name. At that moment, I thought “ジェイコブ” should be right. But I was not sure about the spelling of “Vinther” […], whether it is “ヴィ (vi)” or “ビ (bi)”, and also is “th” “ザ” or something else.

This comment confirmed that professional translator C was looking for the correct spelling of the name in the target language from several options. By locating the article on a reliable website, professional translator C found “ジェイコブ・ビンザー氏” and then typed this spelling in the target text. However, she went back to *National Geographic* and then changed her own translation from “ビンザー” to “ヴィンザー.” In her interview, professional translator C explained why the change was made:

> In this article, “ヴィンザー” and “ビンザー” were inconsistent in spelling, for “Vinther.” I wished I could search to make sure which spelling was correct, but I stopped searching once I considered the time [because this was an experiment]. Normally I type “ヴィ (vi)” for “V,” so I applied this strategy here in my translation.

As professional translator C says, the translation remained tentative. Since the spelling was inconsistent throughout the article, she became uncertain of her own transliteration. Hence, in the revision phase, she again searched for the name and found there were more choices for rendering the name. The finding of inconsistent spelling by comparing multiple pieces of information led her to seek more specific information. After

looking at those websites, professional translator C opened a new search engine tab, typed "Jakob Vinther" (in English), and added "paleontologist" to identify the exact person in the source text. Through this step, she opened the website for the University of Bristol, where the professor works, and perused his biography. She explained, "[By looking at two types of descriptions: 'ヤコブ' and 'ジェイコブ',] I wondered where he is from. He is a professor at the University of Bristol, but he might be originally from other country." By visiting the university website, she finally succeeded in locating information that was more reliable than the information she had found in the parallel text. After finding where he is from, she typed "デンマーク語 Jakob" (in Danish Jakob) into the query to confirm how his name is properly pronounced in Japanese for a person from Denmark. Finally, she applied this spelling, "ヤコブ" to finalize the transliteration.

This searching behavior is characterized by a commitment to verifying information using multiple reliable sources to ensure an accurate transliteration. Professionals are persistent in their searches because they will not settle for a possible error, thus making it acceptable to the target audience as well as the target context.

### 7.2.2 Professional translator D

Similar in-depth background research was observed from professional translator D, who took a total of 16 steps in 0:14:12. His background research time accounts for about 40% of his total search. This time commitment suggests that professional translator D finds background research important. His search session started with reading over the entire original article. According to professional translator D, he read the original article "to confirm the context of the short task text. […] I was not clear about the last sentence, so I checked the original article, and understood how the passage progresses." This comment shows that professional translator D tried to understand the context before translating the article.

Then the translator visited 恐竜図鑑 (A Dinosaur Guide) "to check […] how it was spelled in Japanese […] I also checked what kind of dinosaur it is. What the color of the dinosaur's body is like." The comment shows that the motivation for the background research was to grasp general information about the dinosaur, including body color. This page was referenced several times to compare information found on other websites. After looking at the website, professional translator D typed プシッタコサウルス　体の色 (psittacosaurus body color) into the search engine query. About this step, professional translator D said,"By searching for the name of the body color in Japanese, I found articles in Japanese." Professional translator D made a conscious choice to look for related Japanese articles to gather more detailed information, opening and checking a total of three Japanese articles. Regarding this choice, professional translator D commented:

> I always check several articles. [T]he article from National Geographic spelled “ヴィンター” for “Vinther,” and the other was “ヴィンサー.” This kind of fact won’t be found unless several articles are compared.

This comment indicates an awareness of the pitfalls of depending on a single source for information. This behavior corresponds to the finding from 7.2.1, seeking reliable information. On this initial series of search sessions, professional D explained:

> First of all, the aim of original article has to be understood. So I check a source if available. And then I look for related news, if available as well. I do those things first, and move on Japanese information.

Like professional translator C, translator D tries to translate on the passage level, researching to understand the original text and the meanings of source text words in context.

#### 7.2.3 Student c

Only one student translator, student c, conducted background research. Despite student c being a learner, the motivation behind this translator’s search session is similar to that of professionals, as explained in the interview:

> At first, I wondered about the name of the dinosaur [so I typed it into search engine query] . . . and since the source text mentioned the color, I wanted to see pictures of the dinosaur to check what the color is like.

The translator visited the Japanese Wikipedia entry for “psittacosaurus,” commenting, “I searched to get information about psittacosaurus.” We can see that student c demonstrated behaviors to find background information pertaining to the dinosaur, as seen among the professional translators.

She also went through a step of typing “プシッタコサウルス (psittacosaurus)” into the query box to locate a parallel text, explaining: “I was looking for an article relating to the dinosaur and found one which seemed to be a parallel text.” The motivation for this behavior overlaps those of professional translators C and D, which is indicative of student c being a professional-like researcher compared to the other student participants.

### 7.2.4. Observed features of background research

According to the interview comments on the background research process, the motivation of background research seems the same regardless of translation expertise. These translators conducted background research to gather information in order to grasp the contextual meaning of the text and to seek reliable information. In fact, although this was not mentioned above, professional translator A also conducted background research by reading through the original text while comparing it with the source text. It appears that professional translators are more likely to conduct background research.

Even though the motivation for searching is similar regardless of translation expertise, differences remain between professionals and novices. The characteristic of background research that distinguishes professionals from students is depth. Unlike the professional translators, student c did not read over the original article. In addition, her total time spent on background research was 0:02:17, which is much less time than professional translators C and D, and each step of that searching was shorter as well.

However, every participant who conducted background research tried to grasp the context and general information about the topic until ambiguous areas of the source text (i.e. the descriptions of the dinosaur's appearance) were clarified. Therefore, the key to background research is to find and triangulate several sources of information, requiring multiple search steps and time to read and evaluate each source.

In addition, background research seems to affect the number of subsequent search sessions during the translation. As Enríquez Raído (2013) explains, when a translator has a higher level of domain knowledge, the need for additional information decreases. Professional translator D, who spent the most time on background research and presumably developed the strongest domain knowledge, needed only four search sessions, including background research, to complete the task. This implies that professional translator D did not have to conduct as many shallow searches while translating as students commonly did because he had gathered most of the needed information in advance.

## 7.3 Additional Captured Motivations of Searching

This section describes the professional translators' reported motivations for their searching behaviors in addition to findings on 7.2. From the data, professional translators' motivations for searches are understanding the context, as we have seen in 7.2.2 and 7.2.4, and avoiding mistranslation. On the drive to understand context, professional translator C comments: "I cannot translate without searching. Through searching, I understand what the English (source text) is trying to convey, and I can come up with what kind of scene I translate into Japanese."

This imperative of using searches to understand the context of the original article

echoes comments made by professional translator D concerning background, with the motivation for searching extensively being to understand and translate “pigmentation” accurately. Professional translator C also foregrounded the importance of understanding: “I carry out as much searching as possible with the aim of clear understanding of the source text rather than reflecting what I have researched in the translation.” These comments show that the professional translators invested as much effort as was needed to understand the source context to their satisfaction, reflecting their intention to make their translation convey meaning beyond transcoding texts word-for-word.

The other category of motivation behind searching is avoiding mistranslation. In their comments, the professional translators expressed great care in avoiding mistranslation even on the individual word level. Professional translator C, for example, mentioned, “I search words even when I already know them. There are so many words I assume I know but actually I don’t.” For every translation decision, professional translator C has to be certain about understanding the source text, checking renditions against information retrieved through searching rather than basing them on her own experience or knowledge alone.

In addition, professional translator D explained his concerns when he conducted a search for the term “horned dinosaur”:

> I wondered if it’s okay to translate horned into “角 (literal translation of ‘horn’ into Japanese)” [because the dinosaur, psittacosaurus, actually does not have a horn but the source text says it is a “horned dinosaur”]. In real life, I would have liked to take some more time to decide on the translation, but for today, I was concerned about making a translation that would be considered an error. I kept in mind avoiding mistranslation, to make it as acceptable as possible.

The translator was wary of making a translation error even though the translator did not have as much time in the experiment setting compared to his normal working environment. In this case of the translator browsing through images of the dinosaur, a question arises about using the word “horned” to describe the dinosaur. All the comments examined above show that professional translators are careful about avoiding errors in translation, or at least about attaining a level of translation quality that is at least acceptable.

Among the students’ interviews, we often encountered comments like “I was not sure, but…” and “It might be okay,” which were uncommon conclusions among the professionals. Students may have similar motivations for searching as professionals do but occasionally settle for translating without ensuring understanding of the source text, perhaps due to underdeveloped searching skills.

In summary, the professional translators' strong motivation for achieving a full understanding of source text context and cautious attitude toward translation errors have been identified as factors driving translators to search more thoroughly. Professionals are persistent in their searches because they will not settle for a translation they feel might be an error, thus making it at least acceptable to the target audience as well as in the context of the given source text. From the comparative analysis, it is concluded that professional translators engage in deeper searches for background information to find an acceptable solution before translating the source text, as supported by observed behaviors such as thorough checking, confirming, and comparing.

## 8. Summary of qualitative analysis

In response to sub-question 2, the combined analysis of this research drawing on both screen recording and interview showed that the professionals consciously sought background information, taking time for deep understanding and even attaching conscious weight to it. In contrast, only one student translator out of five conducted similar searching to grasp contextual information needed to make an accurate translation.

The results from the interview data showed that motivation for searching is a significant factor differentiating professionals and novices. The professional translators conducted searches to understand context and avoid mistranslation, driving extensive searching behaviors such as referring to reliable information and checking and comparing multiple sources of information. We can deduce that professional translators continue to search until they fully understand the content or at least find an acceptable solution, whereas novices often stop despite uncertainties remaining unresolved. Information gathered through background research helps professionals find solutions to translate holistically rather than word-for-word or by sentence. This would explain why professional translators take more time on non-dictionary websites to support translating accurately with context in mind.

## 9. Conclusion

This study has investigated how translators' web searching behavior differs according to their level of expertise in translation. Do professional translators exhibit any expert web searching strategies from which translators-in-training can learn? The analysis of both quantitative and qualitative data from this study exhibits that professional translators' search behaviors differ from those of novice translators, or students.

The results showed that time spent on translation and searching was greater among professionals than among students. Professional translators typed words related to both the target and the source texts into the search engine query box. Moreover, professional

translators, at least once, jumped to two websites, or occasionally even three, from the search result page of an entry, whereas students seldom jumped to two and never jumped to three. The difference in searching behaviors between professional translators and students was characterized using the concept of shallow vs. non-shallow searching. Professional translators conducted non-shallow searching as well as shallow whereas students engaged primarily in shallow searching. By observing details of each search through interviews, it was found that professional translators tended to search in order to (1) seek information that was as reliable as possible, (2) understand context, and (3) avoid mistranslation. These specific behaviors constitute elements of competence in information-gathering that translators-in-training can perform to be more like professionals.

There are several limitations in the present study. A larger sample and a variety of text genres should be analyzed to support generalizability since only a magazine text was used. Professional translators were likely to display a translation style specialized to their domain, which should also be considered when selecting texts for future iterations of this study. Their experiences as professional translators may also have affected the outcome. In addition, as the authors did not give the participants strict criteria for the end product, participants' motivation might not have been comparable. For the data analysis, the quantitative data may contain some bias since the session divisions were judged by the author alone.

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