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The Role of Machine Translation in Service-Learning Initiatives

El papel de la traducción automática en las iniciativas de aprendizaje-servicio

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ABSTRACT: This study explores the integration of manual validation and correction of machine-translated outputs (post-editing) within language education through service learning. Service learning combines curriculum learning with community service, addressing community needs and empowering learners. The study presents a pilot case in a Japanese language course, where students translated newsletter articles from Japanese to English using machine translation. The research examines students' linguistic expertise in identifying and rectifying machine translation errors, and their perceptions of the academic journey. The study aims to evaluate the effectiveness and impact of this service-learning approach. Despite the small data sample, the study highlights the differentiated challenges and successes that language learners encounter when post-editing machine-translated texts, as well as the learning outcomes that students have achieved.

KEYWORDS: machine translation; service learning; language learning; Japanese; English.

RESUMEN: Este estudio explora la integración de la validación manual y de la corrección de traducciones automáticas (posedición) en la enseñanza de lenguas extranjeras a través del aprendizaje-servicio. El aprendizaje-servicio combina la formación académica con el servicio a la comunidad, pues permite atender las necesidades de esta al tiempo que enriquece y potencia el aprendizaje y desarrollo de habilidades profesionales en los alumnos. Nuestro estudio presenta un caso experimental en un curso de japonés, en el que los estudiantes tradujeron boletines

informativos del japonés al inglés utilizando sistemas de traducción automática. La investigación examina la competencia lingüística de los estudiantes a la hora de identificar y corregir errores en las traducciones automáticas, así como su percepción del itinerario académico. El objetivo de nuestro estudio es evaluar la eficacia y la repercusión de este enfoque de aprendizaje-servicio.

PALABRAS CLAVE: traducción automática; aprendizaje-servicio; aprendizaje de lenguas extranjeras; japonés; inglés.

1. RESEARCH BACKGROUND

It is said that the majority of global translation needs are unmet. Actually, less than 1 % of global demand is met according to Yamada (2021). This scarcity of translation services perpetuates information inequity, particularly in linguistically diverse communities.

Machine translation (hereafter MT) presents a promising solution to provide translations for this purpose. However, MT occasionally leads to translation errors due to omissions or contextual misunderstandings. Therefore, a manual review is required to ensure the quality of the translation.

The question that arises is: Who could offer manual validation and correction of machine-translated outputs for translation-needy communities? The search for sustainable solutions becomes imperative. Educational institutions, as hubs of knowledge and resources, can integrate manual review of MT outputs into language education curricula, thereby offering both educational scaffolding for language learners and addressing translation deficits simultaneously. Therefore, integrating service learning (hereafter SL) into language education programs emerges as a potential solution.

SL is an instructional strategy that enhances curriculum learning and provides services to the community, offering a platform for practical application of knowledge[1]. Unlike internships, student-delivered service is based on the academic objectives of the course, and students receive credit from their educational institution rather than paying for it. At the same time, students also experience «the development of the intangibles in education and personal development» (Tilley-Lubbs et al. 2005, 161-2), creating a win-win relationship between the parties involved.

Incorporating MT into foreign language education itself is also supported by a number of European foreign language academics so as to embody European multilingualism. It is noteworthy that some of these specialists have launched the project «MultiTraiNMT - Machine Translation training for multilingual citizens», which is supported by the European Commission (Kenny 2022).

[1] By way of example, Campus Compact (https://compact.org/) is an organization of more than 1,100 higher education presidents and 6 million students across the United States that promotes service-learning and has a databank of service-learning practices.

The incorporation of SL supported by MT in foreign language courses not only accelerates multilingual interactions for translation-needy communities, but also empowers language learners and allows for teaching profiles to adapt to future needs.

2. RESEARCH QUESTIONS

The success of the «service» part of MT-assisted SL depends on how well language learners can evaluate and correct machine-translated outputs. Kenny (2022, 195) points out that the use of MT to improve foreign language proficiency requires «a reasonably good knowledge of the foreign language» and lists some possible learning situations in which MT can be used, referring to B1 or B2 levels in the CEFR as sufficient L2 proficiency for the introduction of MT as a learning tool. It is difficult to generalise about the performance of MT, as it depends on the language pair, the direction of translation and the genre of the text, but this provides a starting point for our research. Thus, in order to evaluate the linguistic knowledge required of Japanese language learners when engaging in MT, the following questions should be considered:

a. Which MT errors could Japanese language learners pinpoint, and which remained undetected after the manual validation and correction of students?
b. What kind of errors remained undetected and why?

Both research questions aim to explore the effectiveness of using MT as a pedagogical scaffold to achieve results that foreign language learners may not be able to achieve on their own. Determining the quantity and quality of the remaining errors allows to consider further support needed in the classroom.

The success of the «learning» part of MT-assisted SL, on the other hand, would not be measurable in the same way as the outcomes of the «service» part. Anyway, we have to bear in mind that, in contrast to volunteering, which only revolves around the «service» part, SL also includes a «learning» part. Therefore, SL is only justified if students not only learn by applying their knowledge to the service, but also by performing an act of service.

Participants in an advanced Japanese course who volunteer as «conversation partners» in elderly care facilities (Kurokawa 2012) not only practise their conversation skills, but also learn to act as a responsible social agent in the facilities and listen to the elderly with empathy. Graduate students who translated audio-visual testimonies of atomic bomb survivors in their Japanese-German translation course not only applied their translation skills, they also gained self-confidence and self-efficacy through this project, which has enabled them to contribute to the society, according to their abilities (Patzschke and Tamura 2017). We therefore asked ourselves a third research question:

c. What do students experience during service-learning projects for translation-deficient communities?

3. PILOT STUDY

A pilot case study was conducted to address the research questions outlined above, focusing on Japanese learners at higher education level who translated a Japanese newsletter, published by an NPO Japanese teacher association, into English. The study encompassed 10 newsletter articles, totalling approximately 14,000 Japanese characters, with varying lengths for each article. The readability of the texts ranged from lower intermediate to lower advanced levels, assessed using an automated Japanese text readability measurement system[2]. The resultant translations were intended for online publication as English versions of the original Japanese newsletter articles, with due credit given to the participating students.

The translation project unfolded over an eight-week period during the second term of the academic year. Eight students from a British university, comprising four third-year undergraduates and four master's students, were recruited to partake in the project. All undergraduate students self-identified as native English speakers, whilst only one graduate student made the same claim. The remaining students' mother tongue was Chinese. All eight students were pursuing Japanese Studies degrees. At the outset of the academic year, their proficiency in Japanese ranged between B1.2 to C1 levels according to the CEFR, and assessed through an online diagnostic test[3]. A summary of the participants' profiles is provided below in Table 1.

	Degree	**English**	**Japanese ability**
Student A	UG	Native	B2.1
Student B	UG	Native	B1.2-B2.1
Student C	UG	Native	B1.2-B2.1
Student D	UG	Native	B2.1
Student E	PG	Non-Native	B2.2-C1
Student F	PG	Non-Native	B2.2
Student G	PG	Native	B2.2-C1
Student H	PG	Non-Native	C1

Table 1. Participants' profiles

The project proceeded as follows: initially, students formed groups of three to four individuals, with each member assuming the role of either the first, second, or third post-editor. Group assignments were set by the overseeing teacher of the language class, who also allocated articles to each group member. Given the fewer number of students compared to the number of texts, all students functioned as first editors. Undergraduate students were tasked with translating either two short articles or one lengthy yet less

[2] «'jReadability» (Lee and Hasebe 2019) was used for the purpose. For access and further detail, see https://jreadability.net/en-portal.html.

[3] The assessment was conducted using TTBJ (the Tsukuba Test-Battery of Japanese), operated by the Centre for Distance Learning of Japanese and Japanese Issues (University of Tsukuba, Japan). For access and further detail, see https://ttbj.cegloc.tsukuba.ac.jp/en/index.html.

complex text, while graduate students were assigned a more challenging, longer article. The first post-editor generated the initial translation using two machine translation engines of their choice. Subsequently, the second post-editor, typically a graduate student with higher proficiency in Japanese, reviewed and refined the initial translation, focusing on accuracy. Then, undergraduate students, all native English speakers, undertook the third round of post-editing to further enhance translation fluency and readability in English. Following completion, students were asked to complete a post-project questionnaire to capture their reflective insights. The questionnaire consisted of 14 prompts in Japanese addressing various aspects, such as the project's impact on their Japanese learning and observations regarding machine translation. Four students completed the questionnaire. Comments were written either in Japanese or English.

4. RESULTS

4.1. *Linguistic Analysis*

For the linguistic analysis, 369 translated sentences were examined. The participants utilised a combination of machine translation tools, including DeepL, Google Translate, and ChatGPT (free version), to translate ten articles. These MT engines translated 78 % of the text successfully, and 22 % unsuccessfully. During the post-editing process, students corrected 11 % of the unsuccessful translations. Therefore, students succeeded in reducing the machine errors by half.

Which MT errors could Japanese language learners pinpoint, and which remained undetected? To answer the first research question, we analysed and divided MT errors into errors of «accuracy» and errors of «fluency»[4].

Out of the 22 % of identified MT errors, 12 % were accuracy errors, while 10 % were fluency errors. During the first post-editing phase, involving eight students ranging from language proficiency levels of B1.1 to C1, participants collectively corrected 4% of accuracy errors and 4 % of fluency errors. In the second round, four students with proficiency levels that varied from B2 to C1 managed to correct over 2 % of accuracy errors, but were unable to address fluency errors. In the third and final post-editing round, involving four students with a proficiency level of B1, but all of them English native speakers, no errors were corrected.

The data show that students were able to correct both accuracy and fluency errors to some extent, but were not able to recognise all errors. Then, what kind of errors remained unaddressed? To answer the second research question, we again divided the remaining errors into two main categories: fluency and accuracy errors.

Of the 39 remaining errors, almost half of them were fluency errors, including incorrect technical terms (11 errors) and incorrect proper names (4 errors). This

[4] Accuracy is «typically defined as the extent to which the translation transfers the meaning of the source-language unit into the target». Fluency is «typically defined as the extent to which the translation follows the rules and norms of the target-language (regardless of the source or input text)» (Moorkens et al. 2018, 18). In this paper, fluency also includes aspects such as terminology, style and local conventions.

indicates a lack of information retrieval skills on the part of the students. However, these are language learners, not translation students. Therefore, they are probably not aware of these types of fluency errors. With specific guidance from the teacher, they could have been detected and corrected.

More than a quarter of the unidentified errors stemmed from accuracy categories such as improper interpretation of the source text (6 errors) and grammatical errors (5 errors). They originated in MT tools' inability to understand the sentence structure of the source text. It is noteworthy that in Japanese (source language), a pro-drop language, the omission of subject and object pronouns does not hinder comprehension, while in English (target language) pronouns for subject and object cannot simply be omitted. To fill the gap in English when translating, students must therefore have a good structural understanding of Japanese. The remaining undetected accuracy errors seem to be related to the students' language proficiency and may not be easy to correct.

Although our data sample is small, our study highlights the nuanced challenges and successes that language learners encounter when they validate and correct machine-translated texts. Further language pair-specific studies are needed to investigate the complexity of error detection and correction at different language levels to make an evidence-based proposal for MT assisted SL in foreign language education.

4.2. *Learning Experience*

To address the third research question and investigate the students' experience during a service-learning project, our analysis focused on the responses provided in the questionnaire. One key inquiry in the questionnaire asked participants to rate the project's usefulness for learning Japanese on a scale from 1 (least useful) to 5 (most useful). Responses ranged between 3 and 5, indicating a generally positive perception of the project among students.

The questionnaire comprised numerous open-ended prompts designed to elicit free-form comments from participants. These comments were subjected to analysis following the procedures of thematic analysis, adopting an inductive approach (Nowell et al. 2017). Through this process, four major themes emerged, with the total of 37 codes:

a. Awareness about AI-assisted translation;
b. Benefit of service learning;
c. Language learning;
d. Translation quality.

Figure 1 displays the observed frequency of themes. While the dataset is not extensive enough for generalisation, it provides insights into the prevailing trends within this pilot case. Notably, comments pertaining to the fourth theme, «translation quality», appear with greater frequency, narrowly followed by «language learning» comments. This suggests that, from the students' perspective, the primary takeaway from the project was a deeper consideration of the elements constituting effective translation work. Furthermore, the fact that comments related to language learning were

not the least prevalent theme aligns with the overall positive rating given by students, as discussed earlier.

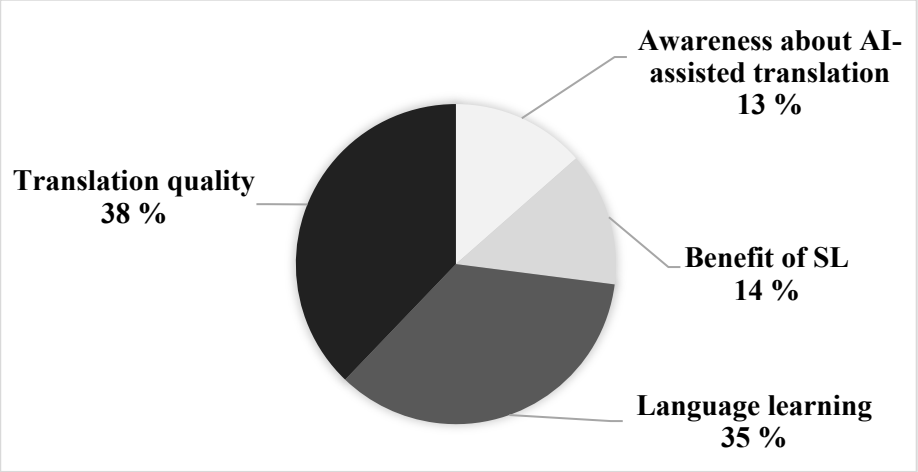

Figure 1. Frequency of themes

Each theme encompassed several sub-themes. For instance, regarding AI-assisted translation, students expressed that machine translation is not always accurate (1), and that AI tools can sometimes translate inconsistently (2). They also felt that they learnt how to use AI effectively (2) (the numbers in brackets indicate the number of codes identified).

> (Ex. 1) «There were times when the AI tools were translating certain words inconsistently, and so it was sometimes difficult to find appropriate terminology, and to keep track of what words were being mis-translated at times» (Student A, UG).

Relating to service learning, students commented that they felt a sense of achievement (2), and that they benefited from collaboration, or working as a group (2).

> (Ex. 2) «Working with everyone to complete the translation of the newspaper article and being able to sign my name to the final product gave me a certain sense of achievement. I had fun for this» (Student B, UG, originally answered in Japanese).

In the realm of language learning, students provided insights indicating that machine translation would aid in the development of language skills (4). Additionally, they noted that translation would help learn new vocabulary (3), and learn cultural nuances (3). Furthermore, some participants remarked that the project improved their Japanese reading skills (2). At the same time, they commented that the project helped them improve their English skills as well (2): a sub-theme quite prominent among graduate students, who were non-native speakers of English.

> (Ex. 3) «Through the translation of the newsletter, I learnt new words and expressions in both Japanese and English. I also learnt about the differences in nuance between Japanese and English. For example, in Japanese, polite expressions are important, whereas in English, brevity is sometimes more important» (Student E, PG, originally answered in Japanese).
>
> (Ex. 4) «Translating Japanese texts into English gave me the opportunity to learn vocabulary and grammar in a real contex […] through this programme, I developed my reading comprehension in Japanese and writing skills in English. […] this programme is

more useful [for my English] than my Japanese skills because it also helps me to improve my English skills» (Student E, UG).

As for the theme of translation quality, students shared insights on the challenges they faced for the sake of quality translation (6). Whilst half of the comments comes from non-native English-speaking students, native speakers of English also acknowledged difficulties in crafting coherent and readable translations into English. Furthermore, participants emphasised the importance of overall meaning in translation (6), rather than adhering strictly to a word-for-word translation approach. Another notable sub-theme that emerged was that simplicity is the key in translation (2).

(Ex. 5) «There are simple ways to translate/convey certain concepts. You do not need to use the most complicated grammar patterns to get your point across. I learned simple and clear is better» (Student A, UG).

(Ex. 6) «We learnt that sometimes the overall meaning is more important than the exact translation» (Student B, UG, originally answered in Japanese).

(Ex. 7) «Carefully considering what sounds right in English was sometimes difficult» (Student B, UG, originally answered in Japanese).

5. CONCLUSION

This paper discussed our attempt to integrate AI-assisted translation and a service-learning approach into the Japanese language classroom. The presented pilot case study suggests that such an integration would be beneficial.

The «service» part of the project can be considered successful insofar as the students' translations helped to convey the message of the client, a NPO which has neither human nor financial resources for translation, on their website in English. Nevertheless, the translation errors that students were unable to identify in this study remain a challenge. As of April 25, 2024, the TranQuality Council[5] suggest the use of «consumer labels» to inform end-users about potential risks associated with translated texts. One way to address the translation quality of our project is, therefore, to make it clear to the reader that the validation and correction of the MT output was conducted by Japanese language learners, while working on a project and syllabus focused on improving the success rate of MT error correction.

The «learning» part of the project, on the other hand, can claim a big success. Teaching a foreign language in an environment where there are few native speakers often requires a high level of motivation from the learners. The students participating in our project seemed to find our translation project beneficial to their language learning process and felt a sense of achievement and self-efficacy, which is not usually easy to expect in a classroom-based language course.

The translation process was obviously accelerated and enhanced by using MT, which suggests that there is merit in incorporating «sound knowledge of MT and a set of skills now often described as "machine-translation literacy"» (Kenny 2022, 195) in the teaching and learning objectives of higher education language programmes.

[5] For the classification of consumer labels, see https://www.tranquality.info/levels-and-labels/.

Given the global shortage of translation services and the MT quality of minor language pairs, this study demonstrates the benefits of MT-assisted SL in a Japanese language course. However, it does not claim that language learners can translate any text at a professional level when supported by MT. On the contrary, what has been suggested is the need for multiple options for multilingual interactions and, as has been shown in this paper, language learners can play a role in helping meet global translation needs.

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