The Use of Machine Translation in Translating Creative Language Elements – a Qualitative Study

Mihalić, Antonela

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Upotreba strojnog prijevoda u prevođenju kreativnih jezičnih elemenata – kvalitativno istraživanje

Studentica: Antonela Mihalić

Mentorica: dr. sc. Nataša Pavlović, red. prof.

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Department of English

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Student: Antonela Mihalić
Supervisor: Professor Dr. Nataša Pavlović
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Abstract

Given the rise in the quality of machine translation (MT) output in recent years and the emerging research regarding its implementation in the translation of literary texts, this paper explores the ways in which translation students use MT while dealing with creative texts. The study focuses in particular on the effects which MT has on creativity. The participants were asked to post-edit one part of a journalistic text, originally written in their L1, into their L2 or L3, and to translate another part of the same text from scratch, in the same direction. Afterwards, they were given a short questionnaire in which they were asked to comment on the tasks. The results reveal some inconsistencies in the participants' responses. For example, the majority prefer translating from scratch, but still use MT in their translation tasks even though they admit it does not provide much help. Most participants also stated that MT had a negative effect on their creativity and that this was one of the main reasons they found post-editing to be the more difficult task. However, the majority would still continue to use MT even when dealing with similar texts. The participants' lack of experience in post-editing, as well as a lack of target language competence in some cases, is likely to have contributed to such findings.

Key words: translation, creativity, machine translation, post-editing

Sažetak

Kvaliteta strojnog prijevoda posljednjih je godina značajno porasla, pa se pojačano istražuje i njegova moguća primjena u prevođenju književnih tekstova. Uzimajući to u obzir, u ovom se radu istražuju načini na koje studenti prevoditeljskog smjera upotrebljavaju strojni prijevod pri prevođenju kreativnih tekstova. U istraživanju se posebno promatraju učinci strojnog prijevoda na kreativnost. Zadatak sudionika bio je da obave redakturu strojnog prijevoda novinskog teksta, koji je izvorno napisan na njihovom materinskom jeziku (L1), na prvom ili drugom stranom jeziku (L2 ili L3) te da drugi dio istog teksta ispočetka prevedu u istom smjeru. Nakon toga su dobili kratki upitnik u kojem su trebali komentirati zadatke. U rezultatima su vidljive određene nedosljednosti u komentarima sudionika. Na primjer, većina je rekla da preferira prevođenje ispočetka, ali u zadatku prevođenja svejedno su upotrebljavali strojni prijevod iako su napomenuli da im on zapravo i ne pomaže. Većina ispitanika također je rekla da strojni prijevod negativno utječe na njihovu kreativnost i da je to jedan od glavnih razloga zašto im je zadatak redakture bio teži. Međutim, većina ispitanika svejedno bi se u budućnosti koristila strojnim prijevodom u prevođenju sličnih tekstova. Manjak iskustva u redakturi, ali u nekim slučajevima i manjak kompetencija u ciljnom jeziku, vjerojatno su doprinijeli takvim rezultatima.

Ključne riječi: prevođenje, kreativnost, strojni prijevod, redaktura

1. Introduction

The development of machine translation tools and the rise in artificial intelligence raise the question of whether there will still be a time in the future where translators are needed. The uneasiness is felt even among the students who have just embarked on the journey to becoming translators, having barely started to hone their skills. It is widely known that repetitive, non-creative texts no longer present such a challenge for MT tools. However, creativity in translation is still believed to be reserved for human translators only. Nevertheless, experiments that test the usability of MT in literary texts, the highest form of creativity, are being conducted and the results are interesting. Taking inspiration from the previous research in this area, the current study was conducted to further analyze the usefulness of MT in the translation of creative texts and the impact it has on the translator's creativity. This study uses journalistic texts containing creative elements (e.g. neologisms, non-conventional idioms and metaphors), and the study is conducted in the context of translator training, with students attending a PEMT course as participants. An interesting aspect of the current study is that it involves translation and post-editing from the participants' first language (L1, Croatian) into their L2 (English) or L3 (Swedish). The experiment will thus contribute to the ongoing research by focusing on a language combination which is underrepresented and it will take a step further in trying to establish whether using MT with creative texts is something that translation trainees would rely on and whether they would find it useful when translating out of their L1. The modalities of post-editing and translation will be analyzed; however, the objective of this research is not focused on the differences in quality between the final products, but rather on the processes themselves. Hence, the analysis of the post-edited and translated texts will not be presented in this paper, but this could be a topic of interest in a future paper. The paper consists of six chapters, which briefly present the previous research, explain the methodology of the current study, give a detailed overview of the results and finally provide some ideas for potential future research.

2. Previous research

The history of machine translation (MT) tools spans several decades, marked by significant developments and advancements, but also periods of stagnation. The origins of MT can be traced back to the mid-20th century. During and after World War II, there was a need for quick translation of scientific and technical documents, leading to the development of early machine translation concepts (Hutchins 1995). The first systems used a combination of linguistic rules and a basic vocabulary. In the following years, rule-based systems dominated MT research. These systems relied on linguistic rules and dictionaries to translate text. Following a period of relative lack of progress between the 1960s and 1990s, the field experienced a resurgence with the advent of statistical approaches to machine translation. Instead of relying on linguistic rules, statistical machine translation (SMT) systems used statistical models trained on large bilingual corpora (Hutchins 1995). The most recent breakthrough in MT came with the rise of neural networks and deep learning. Neural machine translation systems, which employ neural networks to learn patterns and relationships in data, have significantly improved translation quality. Google's introduction of the Transformer architecture in 2017 marked a milestone in NMT development, leading to remarkable progress in translation accuracy (Murgia 2023). Transformer models have become the standard architecture for many language tasks, including translation. Additionally, fine-tuning models on domain-specific data has become a common practice to enhance translation quality. In recent years, MT tools have continued to evolve with improvements in neural network architectures, such as the introduction of large language models like GPT-3.

Even though it is widely known that MT can be useful for translating non-creative texts, such as technical documentation, or even legal documents, it is still severely lacking in the field of literary translation. However, training of domain specific systems became a new area of research which might prove to be useful in aiding literary translation. Toral and Way (2014) asked whether (statistical) MT is ready for literature. They believed that, given the current advanced stage of MT, evident in its increasing adoption within industries (primarily for aiding the translation of technical documentation), it was opportune to evaluate the potential usefulness of MT in translating literary text. Their empirical approach relied on analyzing parallel corpora specific to the text type under consideration. They measured two key aspects: the degree of freedom in translations (indicating the literalness of translations) and the domain narrowness (assessing how specific or general the text is). Thus, they address the challenge of gauging the translatability of literary text by comparing

its degree of freedom and domain narrowness to two other well-explored domains in MT: technical documentation and news. They outlined the potential experiment to determine the success of MT use in literary translation.

The achievable translation quality of (neural) MT for literary texts, specifically novels, was the subject of another study by Toral et al. (2020) titled "Machine Translation of Novels in the Age of Transformer". In this experiment a machine translation system was trained using a substantial amount of domain-specific parallel data, consisting of original novels and their translations. The selected architecture for machine translation was the current state-of-the-art, Transformer. Although the experiments focused on the English-to-Catalan language pair, similar outcomes could be anticipated for any translation direction, especially involving related languages (see Toral and Way (2015) for a similar experiment conducted in Spanish-to-Catalan direction). The evaluation of the machine translation system involved three assessments. The first employed the widely used automatic evaluation metric, BLEU, the other two evaluations were manual. As anticipated, the Transformer-based system trained on domain-specific data significantly outperformed the other systems across all three evaluations, demonstrating a substantial margin of superiority.

Matusov (2019) contributed to the research on the subject of MT quality for creative texts with a study in which an NMT system was trained on literary content and used to translate fiction from English into Russian and from German into English. This was done to show that systems which are trained on literary texts have a richer vocabulary and produce a better score when evaluated using automatic metrics in comparison with NMT systems like Google Translate. The texts were also evaluated by a bilingual evaluator. The results showed that 30% of MT sentences were of acceptable quality. Few syntactic errors were found even in sentences which were rather complex, but the errors in meaning were still numerous. The paper concludes by stating that there is potential for improvement of such trained NMT systems and presents areas of use for automatic literary translation, such as helping professional literary translators in post-editing, but also making untranslated books available to online readers.

Toral and Way (2018) continued to research the potential for implementing MT into literary circles. Focusing specifically on novels, they developed a literary-adapted NMT system for translating from English to Catalan. To benchmark its performance, they compared it with a system based on the traditional statistical phrase-based MT (PBSMT) approach, which was dominant in

the field. For the first time, they trained both NMT and PBSMT systems using extensive amounts of literary texts, totaling over 100 million words. The evaluation involved twelve well-known novels spanning from the 1920s to the present. According to the BLEU automatic evaluation metric, NMT outperformed PBSMT significantly across all the novels under consideration. Overall, NMT demonstrated an 11% relative improvement over PBSMT. In addition to the automated evaluation, a supplementary human assessment focused on three of the novels revealed that native speakers of the target language perceived between 17% and 34% of NMT translations (compared to 8% and 20% with PBSMT) to be of equivalent quality to translations produced by professional human translators. This suggested promising advancements in NMT's ability to handle the intricate task of translating literary texts, particularly novels.

The subject of literary translation using NMT was further explored by Toral et al (2018) in the first ever experiment in which a novel was translated using phrase-based statistical MT and neural MT and then post-edited by professional literary translators. Six translators were asked to translate a fraction of a text from scratch, then to post-edit a phrase-based machine translation (PBMT) output and then an NMT output. For each sentence, the researchers measured the time spent on translation or post-editing, the number of keystrokes and the number of pauses and their longevity. The MT systems were trained and tailored to novels. The results showed that both PBMT and NMT increased translation productivity; that is, post-editing was faster than translating from scratch, with NMT performing better. When it came to the number of keystrokes, NMT again resulted in a significant reduction (23%) in comparison with PBMT (9%), however, it was found that translation from scratch used more keystrokes to type content, while with MT tools keystrokes were more often used for navigation and erasure. NMT, and to a lesser degree PBMT, reduced the number of pauses. However, with translation from scratch, the pauses were shorter than when post-editing.

All of the aforementioned papers showed that training MT systems for a specific domain was the cause of substantial improvement in the quality of the output; however, they did not take into consideration the work that still needed to be completed by the translator or editor and how they might feel about the new type of task presented. Moorkens et al. (2018) addressed this issue in an experiment that employed both statistical and neural MT systems for translating literary works. Six seasoned translators specializing in literary translation undertook the task of producing English-to-Catalan translations under three distinct conditions: original translation, post-editing

using neural MT, and post-editing using statistical MT. Feedback from the translators was gathered through pre- and post-translation questionnaires and interviews. While all participants expressed a preference for translating from scratch, those with less experience acknowledged the utility of MT suggestions. All translators were faster in post-editing NMT rather than SMT output and they all used fewer keystrokes respectively. However, the biggest issue turned out to be the lack of creativity in the output and the subsequent hinderance of their own creativity.

Delving deeper into the topic of creativity, Mehmet and Gürses (2019) dealt with retranslating excerpts from the novel Robinson Crusoe. The experiment featured 21 participants who were 4th year Translation and Interpreting students with some experience in post-editing. They were divided into two groups and were asked to translate two excerpts from Robinson Crusoe from English into Turkish. The first group translated the first excerpt with the help of internet resources but no MT (human translation), and they were asked to post-edit a machine translation of the second excerpt (GT). The second group completed the tasks in reversed order. Upon completion, the participants gave a short, written comment about translating from scratch and post-editing MT. The study aimed to answer how MT-aided retranslation affected the participants' creativity and find out their opinion on using MT in literary translation. Units of creative language were highlighted and analyzed and the results showed that in the MT+PE text the participants preferred to maintain MT solutions and relied on literal solutions, regardless of their accuracy. The percentage of creative solutions was higher in the text which was translated from scratch. Only two participants said that the PE task was easier, while the rest stated that they preferred to translate from scratch. The authors conclude that novice translators are more likely to experience interference from the source language because of literal MT solutions. However, they also stated that the investigation might have some drawbacks because the participants had not yet reached the level of professional translators. The question of whether MT would need a translator in the future remained open for discussion.

The impact of post-editing, that is, of MT use, on creativity was further analyzed by Guerberof-Arenas and Toral (2020), who also implemented a new element – reading experience. In this paper the authors analyze the creativity of the three translation modalities (MT, MTPE and HT) involving the translation of a fictional story from English into Catalan. In order to quantify creativity, they counted the number of creative shifts that happened in each modality. They then asked readers to comment on what each modality was like with regards to creativity, narrative

engagement and enjoyment. Two professional literary translators who engaged in the task were also asked to complete a short questionnaire in which they commented on the type of errors that MT produced, the amount of time it took them to complete the tasks, the effort they felt while completing the task and the potential effects on their creativity. Both translators expressed that the PE phase felt less creative and that it was difficult for them to think outside the box. The results based on the readers' comments, who did not know which modality output they were reading, showed that MT was the most erroneous translation, with the lowest engagement and enjoyment. However, what is interesting to note is that MTPE had marginally higher or the same results regarding the enjoyment in comparison with HT, even though HT was regarded as the best translation overall. It was clear that MT was lacking in many fields, but MTPE might show more promising results in the future.

With the subject of creativity gaining further attention, Guerberof and Toral (2022a) continued their research as part of an EU-funded project, CREAMT. The aim was to analyze what is meant by creativity in different translation situations: machine translation, post editing of MT and professional translation. The authors sought to evaluate how effective MT was in translation of literary texts with regards to creativity in translation and the experience of the user – reader. The MT system was adapted for literary translation, i.e., trained on literary texts, and the HT and PE tasks were performed by two professional literary translators. The language pairs were English to Catalan and Dutch and the text in question was *Murder in the Mall* by Sherwin B. Nuland (into Catalan) and *2BR02B* by Kurt Vonnegut (into Catalan and Dutch). The source text was annotated to distinguish units which have creative potential, such as metaphors, comparisons, puns and wordplay. A pilot study run in 2020 showed that HT scored higher in creativity in comparison with PE and MT, and also higher in narrative engagement and translation reception. PE scored marginally higher results in enjoyment. The main experiment confirmed these results. It was discovered that PE of MT output hinders the translators' creativity and consequentially leads to poorer translation results.

The same authors also conducted a subsequent experiment where the goal was to explore the effects on the translators' creativity and to evaluate how many creative elements were going to be found in the modalities (Guerberof and Toral 2022b). Four translators (two for each language) worked on translating from scratch and post editing an MT text. They also filled out a questionnaire after completing the tasks. Next, five reviewers reviewed each modality, without knowing which

modality they were working on, and were later interviewed to share their findings. The results showed that MT systems made many mistakes and did not produce an overall acceptable translation and contained the least number of creative shifts, which indicated that the translation was mainly literal. MTPE was next in the number of creative shifts, and the best one was HT. The translators stated that their creativity was negatively impacted by MT and that it was easier to translate from scratch. The effort needed to complete the tasks was greater during the MTPE task, but they were overall faster. They did say, however, that MT could be useful in those parts that were more straightforward and mechanical. Sometimes they were even surprised by the quality of MT output, but it was very much lacking in the creative parts. The reviewers, who performed a blinded post-editing task, also agree that the MTPE and MT texts cannot measure with the quality of HT. The final conclusion made was that the use of MT in literary translation could lead to subpar translations.

In summary, the papers presented above arguably prove that NMT systems are making a breakthrough in MT quality, especially those which were trained for a specific domain. It can also be concluded that, while post-editing of MT output makes translation faster and the translators more productive, it seems to be less liked than translation from scratch and it also seems to impair the translators' creativity in most cases.

3. Research aim and questions

For the purposes of this research, the use of machine translation is defined as any use of an MT tool in the form of entering a term(s), part of a sentence, the whole sentence or the entire text, into an MT tool, regardless of whether the MT solution appears in the final version of the translated text delivered by the participant. For the purposes of this research, the term *creative text* includes a text which contains innovative linguistic elements such as neologisms, nonce words, idioms and/or metaphors.

The use of MT in the translation of creative texts is a field that is still being researched, and the texts that are mainly used in such research are mostly literary texts, especially novels. However, non-literary creative texts are not sufficiently covered by previous research. This study will use a non-literary creative text abundant with creative language elements (neologisms, nonce words, metaphors, idioms) to explore the way machine translation is used, determine the purpose behind its use and the impact on the result itself, i.e., it will try to understand whether MT helps the participants in finding the translation solution or makes the process more difficult. The experiment will also try to conclude whether MT has a negative effect on the creativity of the participants, which was a common conclusion in previous research. Therefore, the goal of this study is to determine if and how translation students use machine translation when translating from Croatian (L1) into English (L2) or Swedish (L3), especially a text which is filled with creative elements. One of the main objectives is also to gain an insight into the translation process itself and the translator's impressions of using MT for creative texts. Taking into consideration the previously mentioned objectives, this paper will try to provide answers to the following research questions:

1. Do translation trainees use MT tools when dealing with non-literary creative texts? If they do, in what way? What are some common strategies?
2. What does the post-editing and translation process of translation trainees look like for texts containing creative elements?
3. Does the use of MT have an impact on the trainees' creativity?
4. How does the use of MT tools influence the process of finding the translation solutions?
5. What are the differences, if any, between the use of MT when translating into one's L2 vs. L3?

This research will contribute to the still under-researched field of MT use in the translation of creative texts by presenting an experiment which deals with non-literary creative texts. It will include Croatian as an under-represented language, while also focusing on a different translation direction – into the participants' L2 or L3.

4. Methodology

This chapter discusses the methodology used in the creation and execution of the experiment. The main aspects that are addressed are research design, the participants involved, and the source texts.

4. 1. Research design

This researched was partially inspired by the research conducted by Mehmet and Gürses (2019), which included Turkish translation students who translated excerpts from a novel from scratch and post-edited an MT text. The research in this paper deals with translation and post-editing from Croatian into English or Swedish. This direction was chosen because translating into L2 and L3 is generally considered to be more difficult than translating into one's L1, so the use of MT tools might prove to be more helpful to translation trainees in this direction. It was also chosen because previous research mainly focused on translating from English, so this experiment will also test whether the same results from the previously conducted experiments match the results in this one. The MT tool chosen for the post-editing part of the experiment is Google Translate because it is one of the most frequently used MT systems with around 500 million users and 143 billion words translated daily (Wolverton 2018). The research consisted of three parts: post-editing, translation, and a post-task questionnaire.

4.1.1. Post-editing task

In the first part of the research task the participants were asked to post-edit a machine translation produced by Google Translate in their L2 (English) or their L3 (Swedish) and they were provided with the source text in Croatian. The source text consisted of 79 words and included eight creative elements (*ruka ruku mije, džepoljublje, državni vrh, upalila se /komu/ lampica, koronakriza, puna šaka brade, koronaš, superširitelj*). The English machine translation consisted of 123 words, while the Swedish MT output consisted of 100 words. The texts are included in Appendix 1. Before starting the task, the participants were given detailed instructions (Appendix 2) via the Moodle-based distance learning system. The participants were asked to use a free online

screen recorder[1] which captures their entire screen and allows for tracking their progression while completing the task. The videos captured using the screen recorder were used to analyze the way in which participants completed the task, specifically which aids they used, how they dealt with the creative elements and whether additional MT systems were used in the process. The students were given 30 minutes to complete the task.

4.1.2. Translation task

The second task that the participants needed to complete was the translation of a text from Croatian into English or Swedish. The text consisted of 84 words and included 8 creative elements (*upala je sjekira u med /komu/, bacati drvlje i kamenje, stožeraš, pohrliti kao pčele na med, pomrsiti planove, koronašpek, kao rukom odneseno* and *šmrcosram*). As was the case in the first task, the participants also received all the necessary instructions via the e-learning platform and were asked to use the screen recorder to capture the video of their translation process. The text and the instructions are included in Appendix 1 and 2 respectively. The participants were given 30 minutes to complete the task.

4.1.3. Questionnaire

After completing the post-editing and translation tasks, the participants were given a questionnaire with five open-ended questions, four of which were related to the completed tasks, while in the last question, the participants could freely comment on the points they found important or interesting. Here is a list of the questions:

1. Compare the two tasks you have just completed – post-editing and translation. Which one did you find to be easier and which one more difficult? Please explain.
2. In what way, if any, did MT help with or hinder your completion of the translation and post-editing tasks, especially regarding the creative elements? Please explain.
3. Would you use machine translation in the future when dealing with a similar type of text? Why (not)? If yes, in what way?

[1] https://apowersoft.id/free-online-screen-recorder

4. Compare the tasks you have already done in class which involved translating/post-editing in(to) Croatian. Did MT in any way help with or hinder your translation into L2/L3? Would you use MT in the future with this translation direction?
5. Is there anything you would like to comment on regarding these tasks or generally about translation which has not already been mentioned?

4.2. Participants

All the participants in this research are first year graduate students who were attending a course in post-editing and machine translation quality assessment at the time of the study. The experiment took place mid-way through the course so that the participants had already gained some basic understanding of MT systems, how they work, as well as their benefits and limitations when used for specialized and technical texts. This ensured that all participants had a similar level of knowledge regarding machine translation. However, the participants' educational backgrounds differed in other respects.

Of the total number of 17 participants, 13 participants were students of English language and literature, eight of whom were enrolled in a translation track. The remaining four participants were students of Swedish language and culture, also with a focus on translation.

This research was conducted both in class and remotely. Fourteen participants (11 students of English and three students of Swedish) completed the research tasks in class and submitted the videos of their translation and post-editing tasks, as well as the questionnaire responses. These videos will be compared against their final translation/post-editing file and the questionnaire will be analyzed. An additional three participants (two students of English and one student of Swedish) completed the research tasks remotely but did not provide the videos of their translation/post-editing tasks. Instead, this group of participants provided a brief explanation of the translation/post-editing process and the elements for which they struggled to find the appropriate solution. The tasks of translation and post-editing were not completed by homogeneous groups since the English students who do not study translation were also asked to translate/post-edit the texts in English. However, the results can still be regarded as comparable with the results of English students who study translation. This is because English students who do not study translation as part of the English graduate program still study translation within the

scope of their language and literature program in another language (Russian, German, Italian or Swedish). Therefore, the participants were grouped as follows:

Group A – 11 participants; students of English (translation focused (6) and non-translation focused (5) programs), tasks completed in class

Group B – 2 participants; students of English, translation focused, tasks completed remotely

Group C – 3 participants; students of Swedish, translation focused, tasks completed in class

Group D – 1 participant; student of Swedish, translation focused, task completed remotely

The main difference between groups who have completed their tasks in class, but also between those who have completed them remotely, is that the groups A and B had to complete the task in their L2, while groups C and D had to do so in their L3. For simplicity, when analyzing the participants' answers, each participant will be marked with a number and letter of the group they belong to (e.g., Participant A1 is an English student who completed the tasks in class; Participant C1 is a Swedish translation student who completed the tasks in class, etc.)

4.3. Source texts

Since the majority of research that deals with MT's impact on creativity involves literary texts, this study was conducted to provide results on other types of texts, specifically a journalistic creative text. The additional benefit of choosing such a text was its short form. This is why the source texts were not chosen from the literary genre, but were a collection of different on-line sources, such as newspaper articles and essays, in which instances of creative language could be found. These instances were then compiled into a short text which contained a large number of creative elements, from metaphors and idioms to nonce words. The text, which was divided into two parts, i.e., two short related pieces (one for post-editing, one for translation), is included in Appendix 1.

5. Results

This chapter presents the results of the analysis of the translation and post-editing tasks, as well as of the questionnaire responses.

5.1. Post-editing task

The first part of the research task included post-editing. The participants were asked to post-edit a machine translation produced by Google Translate in English or their L3 and they were provided with the source text in Croatian. Most of them used a screen recording software to capture their progress, and these results will refer to those who did (N=14).

Of the 14 participants who completed the tasks in class and who were able to submit the videos, 11 were students of English and three were students of Swedish. The average time it took the students of English to complete the task was 19 min and 53 sec, with task duration ranging from 14 min 56 sec to 25 min 1 sec. It took the students of Swedish on average 20 min and 57 sec to complete the task, ranging from under 17 min (two participants) to 28 min 31 sec (one participant). It is also interesting to note that the Swedish participant with the longest time used an online MT system as an additional aid in completing the task, while the English student with the longest time did not use MT apart from the output provided for post-editing. What is also interesting to point out is that of the 11 English students, only three used online MT systems as an additional aid in completing the task, while all three Swedish students used it quite frequently.

The analysis of the videos and files with the final version of the post-editing text shows that the participants had the hardest time finding the solutions for the following three elements: *ruka ruku mije, džepoljublje* and *puna šaka brade*. Among the English students, the participants spent a lot of time looking for the definitions of these elements. Most of them also used Glosbe online dictionary and some used Sketch Engine or Hrvatski jezični portal (Croatian Language Portal, HJP). The process of finding the appropriate solution usually followed similar steps. In case of the element *ruka ruku mije*, the participants would first google the provided MT solution (in this case they would google "hand washes hand"). The search would then result with an idiom *one hand washes the other.* The participants would then opt to use Glosbe and search for *ruka ruku mije*. The results would include idioms *one hand washes the other* and *you scratch my back and I'll scratch yours*. After confirming the accuracy of the idioms in a dictionary (usually Cambridge

Dictionary or Oxford Learner's Dictionaries) they would choose one of these solutions. Only two participants used Google Translate with the first element. One searched for the translation of just the element, while the other translated the entire sentence which contained the element. The solutions were then googled. It is safe to say that the solutions did not provide additional help since they were the same as the ones in the MT text provided by the researcher.

There was a bit more creativity involved with the element *džepoljublje*. It is a nonce word, a word "coined and used apparently to suit one particular occasion" and is also called an occasionalism (Encyclopedia Britannica). In it one can recognize two words: *džep* (pocket) and *ljubiti* (to love). It literally means "to love one's own pocket" which is similar to the MT solution ("love of pocket"), or figuratively, only caring about one's own wealth. The participants struggled with finding the meaning of this element and almost all of them googled it. Only four participants immediately figured out the meaning and produced their own solutions without research. The solutions ("love of money", "greed" and "love of excessive wealth") were similar or at times identical to the ones produced by other participants. Glosbe was used by five participants but it provided no results so they also had to resort to their own creativity in order to find the solution. One participant used Google Translate to translate the sentence which contained this element, but the solution was the same as the one in the MT text, so it provided no help. The main difference in the steps that the participants took to find the solution for this element in comparison with the previous element is that for the element *džepoljublje* they used Google to find the meaning of the element in Croatian, while for *ruka ruku mije*, they used Google to find possible translations of the idiom. This is indicated by the searched phrases, e.g., "ruka ruku mije english translation", "idioms that mean to benefit from", "one hand washes the other synonyms", etc.

A similar approach can be observed with the idiom *puna šaka brade* (MT solution: "fist full of beards"). According to the Croatian Language Portal, the idiom is used to describe "the best possible outcome" or "to express great satisfaction" (Hrvatski jezični portal). All the participants first googled the Croatian idiom to find its meaning and then they searched for items such as "idioms that mean satisfaction", "to hit the jackpot synonyms", etc. They also used Glosbe to find possible solutions or to search for synonyms. The translation solution was usually a mix of their own creativity and a solution from Google. They had to be creative to first come up with an idiom or expression that means "the best possible outcome" and then they searched for synonyms for that expression. None of the participants used additional MT tools.

Finding the appropriate solution for the element *upalila se /komu/ lampica* was somewhat simpler since the MT solution ("light bulb went on") was a usable one. Apart from one participant who immediately changed the MT solution, and one participant who decided that the MT solution was correct without researching it, all other participants opted to check whether the MT solution was appropriate by either googling it or checking in the Glosbe dictionary. Two participants wanted further confirmation so one of them used Sketch Engine to check the number of occurrences of the MT solution in the English corpus, while the other checked an online dictionary. The translation solutions were either changed to "light bulb went off" or left as they were, that is, the MT solution remained unchanged. Two participants decided to completely change the MT output and used the expression "get an idea".

The element *državni vrh* (MT solution: "the top of the state"), which is a metaphor for the most important officials of the country, namely the President and the Prime Minister and sometimes the Speaker of Parliament, was handled next. Six participants produced their own solutions without any additional help, while five googled possible solutions or looked them up in Glosbe. In the end they all came up with their own solutions which included "head of the state", "top officials", "people at the top", etc. None of the participants used additional MT tools, and nobody regarded the MT solution as acceptable – every participant corrected it and produced their own solution.

However, it seemed that MT provided some help for the following three elements: *koronakriza*, *koronaš* and *superširitelj*. These three neologisms are related to the coronavirus pandemic, so one might expect that MT would easily deal with these elements given the number of texts produced about it. The element *koronkriza* was easily handled by MT as "coronacrisis". All the participants regarded the MT solution as acceptable and did not spend time researching the term. The element *koronaš*, however, was googled by four participants and searched in Glosbe by three participants. One participant even used Google Translate to translate the sentence which contained this element. The meaning of the element is "a person infected with the coronavirus" (Pojmovnik koronavirusa). The MT solution "corona people" was corrected to "corona infected people" by eight participants and left unchanged by two participants. The term *superširitelj* defines a person who can "easily spread the disease to many people" (Pojmovnik koronavirusa). The MT solution "super spreader" was deemed correct by two participants, seven participants googled the

MT solution and then corrected it to “super-spreader”, and the last two participants also corrected it in the same way after using Google Translate to translate the term and then googling the output.

The process of post-editing was very similar for the majority of the participants. Some participants decided to highlight problematic MT solutions and creative elements before starting the post-editing process, but all of them spent the majority of time researching possible solutions for idioms because the MT system provided incorrect ones. Even when MT managed to provide an acceptable solution, the majority of the participants needed to check whether the solution was in fact correct by looking it up in an online dictionary, a corpus or searching the internet. It is interesting to note that even in a post-editing task some participants still decided to use an MT tool as an additional aid. This, however, proved to be unhelpful because MT provided the same solutions which were already present. Although MT alone did not provide help, many participants considered it a starting point for further research. Many of them began googling the solution that MT provided and, in some instances, it led them to a solution fairly quickly and not much time was lost. However, idioms and nonce words proved to be a challenge and only their creative approach resulted in an acceptable solution. It is interesting to note that among the participants who provided their own solutions to certain elements without any research, the time it took them to complete the task considerably varied. For example, Participant A5 and A6 offered their own solutions to two elements and completed the task in 22 min 8 sec and 23 min 29 sec respectively. Participants A1 and A8 who provided no solutions without previous research completed the task in 16 min 1 sec and 16 min 40 sec respectively. In these particular instances the discrepancy was not the result of the time it took to come up with a creative solution on their own. It occurred due to the time they spent researching other elements for which they did not immediately find a solution. It also must be noted that participants who needed more than 20 min to complete the task usually spent much time researching a single element with which they struggled. In most cases this was the idiom *puna šaka brade*. It seemed as if they could not decide which solution to use out of the many possible ones that they found. This might be due to insufficient experience in post-editing, or indeed translation. The participants who completed the task in under 20 min did not have trouble deciding on the appropriate solution. When they found one which they deemed correct, they used it and did not search further for possible synonyms. None of the participants spent much time focusing on syntax and grammar since MT was correct in those instances.

Among the students who worked with the Croatian-Swedish combination, it took participants C1 and C2 a relatively short amount of time to complete the task (17 min 29 sec and 16 min 51 sec respectively), while participant C3 completed the task in 28 min 31 sec. The approach to completing the task was similar in many instances. For example, the participants used aids such as Glosbe to help them search for a potential solution. They also relied on tools such as online dictionaries (Lexin, bab.la, Linguee, Saol) and they additionally used Google to search for possible solutions. In most cases they googled the MT solution which then served as a starting point for further research. All the ideas that the participants came up with were checked for accuracy in online dictionaries. Specifically, Participant C1 first tried Glosbe and then googled the MT solution while dealing with the elements *džepoljublje* and *upalila se /komu/ lampica.* With *ruka ruku mije* they googled Swedish idioms with the element "hand". They also used Google Translate to translate possible solutions both from Swedish into Croatian and vice versa. The translation solutions were combinations of their own ideas and elements which they googled. Participant C2 used a slightly different approach. In addition to using Glosbe, online dictionaries and googling, they also often used additional MT tools (Google Translate and DeepL). However, they used English as an intermediary language meaning that they used MT tools to either directly translate the creative elements from Croatian into English and then, after paraphrasing them or correcting them, used MT to translate the solution from English into Swedish. For example, when dealing with the idiom *puna šaka brade*, Participant C2 first googled the meaning of the idiom and them searched for the potential solution in English. After deciding on the solution "to hit the jackpot" they translated it using DeepL into Swedish. Then they checked the MT solution using online dictionaries. This seemed to be a successful approach since this was the predominant way in which they dealt with other elements as well. Using an intermediary language in which they felt they were more competent than in their L3 seemed to be helpful, since they were able to produce solutions rather quickly. Participant C3 also often used the same approach. They first highlighted all the problematic elements in the MT text and then either googled them or searched for the solutions in Glosbe. If they found no appropriate solutions, they would then use Google Translate to translate potential solutions that they came up with in Swedish into English. After correcting the English solution, they would then translate it back into Swedish. Therefore, the best approach for them turned out to be going back and forth between English and Swedish until an appropriate Swedish solution was found. Translating from Swedish directly into Croatian and vice versa was

also used, but rarely. It usually occurred when they had only started to deal with the element but found unusable results. Swedish students made use of MT much more often but it was done in a specific way – to facilitate the paraphrasing of difficult idioms into a foreign language, which were then modified for use in the target language. Using an intermediary language was not observed among the participants who worked with the Croatian-English combination.

5.2. Translation task

The second task that the participants needed to complete was the translation of a text from Croatian into English or Swedish. The participants were also asked to use a Screen Recording software, as in the previous task.

Of the 14 participants who completed the tasks in class, ten were students of English and three were students of Swedish. The average time it took the students of English to complete the task was 23 min and 16 sec while it took on average 27 min and 53 sec for the students of Swedish to complete the translation. Since the students themselves have commented about the difficulties of translating into L3 (see section 5), the discrepancy in times is likely the result of insufficient skill and practice in translating into L3. The participants admitted that they do not feel competent enough yet to produce a quality translation in their L3. Among the students of English, it took the students who are enrolled in an English translation program 22 min and 21 sec on average to complete the translation in comparison with 25 min and 43 seconds which is the time it took students who are not enrolled in an English translation program to complete the translation. What is interesting is that the fastest and slowest times were achieved in the latter group of students (non-translation program) with the fastest time of 14 min and 36 sec and the slowest time of 31 min and 47 seconds. The translation students usually took between 21 to 25 min to complete the task.

Watching the videos of the translation process was extremely interesting. It allowed for a view into the translation process of each participant, the tools they used, the struggles they faced and the interesting solutions they came up with. It is important to note that the translation processes were mostly similar in structure. Most, although not all, of the participants usually started off with highlighting the problematic elements and then continued to do the translation, after which they edited the text and submitted it. However, it was the use of tools which was particularly interesting to observe. Among the students of English, three participants (A1, A9 and A11) did not follow the

previously described structure. Their first move upon opening the text was copying it and pasting it into an MT tool (in two cases it was Google Translate, in one case the text was first translated using an MT tool integrated in Microsoft Word; afterwards it was copied and pasted into GT). This approach meant that they in fact performed post-editing, just like in the previous task. These participants completed the task in 25 min 27 sec (A1), 23 min and 3 sec (A9) and 22 min 19 sec (A11), which is approximately the average time for completion. Participants A9 and A11 are students of English with a focus other than translation and Participant A1 is a student of English with a focus on translation. Participant A1 also used other interesting tools in their translation process. They were the only one to use Sketch Engine to try to come up with potential solutions. For example, while dealing with the idiom *pohrliti kao pčele na med* (=to flock to something because you find it very exciting or attractive), they looked up the word "bee" in Sketch Engine and looked for possible collocations. They also used Sketch Engine during their post-editing task. They dealt with the creative elements usually by looking them up in Glosbe dictionary. The other way was to use the MT solution as a starting point for further research. They would also search Google for the meaning of the idiom and potential synonyms. This kind of search would usually produce usable results. For example, the idiom *sjekira je pala u med /komu/* (=to have an unexpectedly positive outcome) was dealt with in the following way. The participant googled "make a fortune synonym" and Google produced potential results (e.g., "hit the jackpot"). It is interesting to note that when Google produced no usable results and the participant was left to their own devices, they produced rather creative results. For example, they initially translated the neologism *koronašpek* as "pandemic food baby", referring to the larger belly from gaining weight. When MT was not involved in the translation process, the creativity of the participant really shined. However, in this particular case, no evidence was shown that MT hindered their creativity, simply that using it was an initial and almost natural decision. The participant used some kind of aid in translating almost every element. Even when they came up with a solution on their own, they would google it and opt for a different solution or a different approach altogether. Sometimes they would choose to replace their descriptive translation with an idiom or phrase they found while researching. They immediately came up with a solution for one element (*pomrsiti planove* – to disrupt a plan). Overall, Participant A1 relied heavily on MT, used it as an inspiration for solutions or for the googling process, but also managed to come up with creative solutions themselves. It seemed as though MT was more of an aid in the process rather than a hindrance.

Participant A9 frequently made use of machine translation, often depending on its outputs as a foundation for exploring possible solutions. On three occasions (*koronašpek*, *šmrcosram* and *kao rukom odneseno*), they generated solutions spontaneously without external assistance or prior research. Their typical method involved searching for the meaning of the element using Google and subsequently seeking possible solutions. For example, the machine translation of the idiom *bacati drvlje i kamenje* (=verbally attack someone) was used as a base for the solution. The participant focused on "throwing stones" and searched for idioms related to "stoning". They came across an example of stoning as a punishment for a crime, so they then searched for idioms with the meaning "to blame somebody for something". Their eventual translation solution was one of the listed idioms ("point a finger at somebody"). It is interesting to note that even when the MT solution was obviously just a literal translation, they still decided to check whether there was some kind of logic behind it or whether this could be the path to finding the ending translation solution. For example, when dealing with the idiom *sjekira je pala u med /komu/,* which was translated literally by the MT tool ("axe fell into honey"), the participant correctly assumed that this was not an appropriate solution and decided to search for idioms related to luck. When they decided on their translation solution ("to strike gold"), they still chose to google the MT solution just to check whether there is a similar idiom with the component "axe" or "honey". This relates back to the post-editing task in which almost every participant checked every MT solution even though it was expected they would not be appropriate. This shows that MT use is deeply integrated into the translating process of the participants and that it is the first aid they decide to use when dealing with a new text.

Finally, the last participant who began the task by copying the text into Google Translate was Participant A11. Apart from this initial use of MT, the participant also used it at different times of the translation process. For example, they would use MT to translate sentences or phrases which contained the problematic creative element. This was interesting because the MT tool already provided them with the complete translation of the entire text. The MT tool provided the same results when presented with just one sentence or phrase, so subsequent uses of MT were not fruitful. The remaining translation process was very similar to that of Participants A1 and A9. They would search Google for the meaning of the idioms and phrases, they often made use of tools such as Glosbe dictionary which provided useful results, but they also displayed a degree of creativity. The elements *koronašpek* ("overeating during lockdown") and *šmrcosram* ("sneeze-shaming")

were translated directly without any additional aid or research. However, once they came up with the solution, they searched it in Google to check whether it had already been used.

Participant A2 also used MT but not in the way the previous three participants used it, that is, Participant A2 did not copy the text into an MT tool and then perform post-editing, but rather used Google Translate to translate sentences and phrases containing, what was for them, a problematic element. Apart from using MT, they also used Glosbe dictionary and they searched Google for possible solutions. The participant completed the task in 23 min 5 sec, but what is interesting to note is that they did not provide any solutions for one element (*pohrliti kao pčele na med*). It is not clear from the video whether the participant deliberately chose to omit this element from the translation, but it seems as if they simply did not notice the omission since the element was not highlighted or researched in any way. Omissions like this one happened with one other participant (C1). Participant A2 also decided to get creative with the elements *koronašpek* ("corona belly") and *šmrcosram* ("sniff-shaming"). The participant also provided the solution for the idiom *kao rukom odneseno* ("disappear in no time") without any research or aid. A similar approach was followed by Participant A7. They used MT with every element, sometimes putting in entire sentences and sometimes just the element. After this, they usually also searched for the elements in Glosbe dictionary. Their solutions were usually corrected MT output, so it is safe to say that MT sparked their creativity and provided aid. They were quite sure that their ultimate translation solutions were correct and completed the task in 25 min 10 sec.

Another interesting approach to this task could be observed in the translation process of Participant A3. They completed the task in 18 min 32 sec which is quite faster than the average time. It was clear from the video that the reason for such a result was that they used practically no aids at all during the translation. They only searched for the meaning of the element *sjekira je pala u med /komu/* in Google and Glosbe dictionary and found the solution "to hit the jackpot". The other element which they searched in Google was *stožeraš* (= a derogatory term used for people in power responsible for handling the lockdown measures during the pandemic) and they decided to employ a descriptive approach in which the negative connotation was lost. They did not use any MT tools in their translation process and they came up with the majority of the solutions on the spot and without any research. It seemed as if the translation task was much easier for them since they were able to find appropriate solutions immediately and they were sure that those solutions were correct, so they wasted no time in checking them, which many other participants regularly

did. Participant A6 also went with the same approach – they used basically no MT tool help except for one word which was not a part of the creative element. It was obvious from the video that they simply could not remember its translation immediately and then searched for the translation using Google Translate. They also came up with most of their solutions without extensive research, but they moved away from the idiomatic solutions and chose more descriptive ones. Those that were idiomatic were usually either googled or searched for in Glosbe dictionary, but the solutions were not directly taken from dictionaries but rather were a combination of the provided solutions and the participant's own creativity. Participant A4 also had no trouble coming up with the solutions themselves. They did, however, make use of Google with some elements. They searched for "phrases to express dissatisfaction or anger" and "phrases that mean to attack someone" to find the solution for the idiom *bacati drvlje i kamenje*. They found many idiomatic solutions but chose to simply use the verb "to berate". What is interesting to note is that they immediately offered a solution for the element *stožeraš* which many other participants decided to google or look for in Glosbe dictionary. The other elements were not researched and the solutions were provided on the spot, without checking their accuracy, which does not correspond to what many other participants decided to do. This participant did not use MT in any way. The same mode of operation was followed by Participants A8 and A10. They both used Glosbe dictionary and Google to search for solutions but did not use MT. What is most interesting about these two participants is that their videos were very similar, but the time difference in the completion of the task is the biggest. Participant A8 completed the task in a little over 14 minutes while Participant A10 completed the task in just under 32 minutes. They both searched in Glosbe for the same elements, they both checked their solutions using Google, but it was obvious that Participant A10 is a lot more uncertain about their solutions so they spent much more time doing what looked like thinking about the solution at hand. There was no activity on the screen, so thinking seems to be the only logical explanation. Participant A8 usually checked in Google the first solution that Glosbe dictionary offered and decided to go with it. Both participants offered their own solutions to some creative elements (*šmrcosram*, *koronašpek*), but it seems that the only thing that contributed to the difference in times was the time it took them to decide whether something was correct. They are both students with a focus other than translation.

Participant A5 was the only participant to use the latest technology as aid in completing this task. Knowing that MT would probably be of no use, this participant used the next best thing

– AI. Chat GPT provided this participant with excellent and idiomatic solutions and significantly facilitated the completion of this task. While some participants had to google phrases such as "criticize someone idiom", Participant A5 simply asked Chat GPT to tell them the idiom with the same meaning. They used it to translate elements *sjekira je pala u med /komu/* and *bacati drvlje i kamenje*. However, for some elements they still decided to see what Google Translate had to say, so they put in *pohrliti kao pčele na med* and *stožeraš*. For these elements the ultimate translation solutions were corrected MT solutions. Elements like *koronašpek*, *kao rukom odneseno* and *šmrcosram* were translated directly, without any aid or research. They completed the task in 21 min 38 sec, however, it must be noted that a significant amount of time, around 3 min, were spent trying to log into Chat GPT, so the actual time is shorter.

After watching and analyzing all the videos of the Croatian-English translation task, the results can be summarized as follows: There is a clear difference between the elements which were googled or put into MT and those that were translated on the spot, without any aid. The idioms *sjekira je pala u med /komu/* and *bacati drvlje i kamenje* were mostly searched for in Glosbe dictionary and then googled. MT was used if the whole text was put into GT, but no individual elements were translated using MT tools. The elements *stožeraš* and *pomrsiti planove* were next by frequency of search in Glosbe, but *pomrsiti planove* was also put into an MT tool. *Pohrliti kao pčele na med* was put into MT quite a few times and the solutions were usually corrected MT output. The elements which were clearly translated without aid most frequently were *koronašpek* and *šmrcosram*. The reasons for this are that they are neologisms, which MT generally does not deal with well, and there are limited ways in which they could be searched for in Google, so the participants were left to their own devices. The solutions were rather creative and usually did not take too much time to come up with. The general impression was that the participants were not hindered by MT and coped much better with this task than the previous one. There were no clear differences between students who study translation and those who do not, however this could be due to the fact that all of the students who do not study translation at the English Department still study translation at other respective language departments.

The Croatian-Swedish translation task was very different since the participants were all translating into their third language. Proficiency, idiomatic language and even interference from their second language make this a more difficult task. Participant C1 completed the task in 32 min 51 sec, which is overall the longest time it took to complete the task. (Interestingly, they were not

the last to complete the post-editing task.) It is clear from the video that this participant ended up in a loop of MT translations and corrections. For example, the first idiom *sjekira je pala u med /komu/* was put into Google Translate (Croatian-Swedish), then it was looked up in a dictionary. The MT solution was then googled and corrected. The corrected version was then put into GT (Swedish-Croatian). This mode of operation took the participant a lot of time and it was repeated with almost every element. There were frequent uses of MT but no real idiomatic meaning was kept in the translations, they were all based on literal meanings. It is clear that MT actually hindered this participant's translation process since they looked up every MT output in the dictionary (usually with little to no results); they would then alter the solution and put it into the MT tool with languages reversed. Eventually they would find a solution, a descriptive one, rather than idiomatic, or literal in some instances, but a much better approach would have been not to use MT to translate individual elements. This participant even used MT on elements that the other participants translated immediately with no aid (*šmrcosram*). The element *koronašpek* was left untranslated. It seems as if the participant simply overlooked it since it was not put into an MT tool or dictionary.

Participant C2 used an entirely different approach. They completed the task in 21 min 27 sec. They relied heavily on English as an intermediary language and handled every element in a similar way. For example, they came up with the solution for the idiom *sjekira je pala u med /komu/* in a way similar to the students of English. The participant googled idioms with the meaning "to get lucky" and then used DeepL Translate to find the solution in Swedish. The participant first translated most of the text into English without aid, and then put the text in English into DeepL to get the translation into Swedish. The corrected MT output was the ending translation solution. The idioms were usually simplified or handled descriptively so that the MT tool's literal translations would not get in the way. Relying on their L2 was something that this participant did in the post-editing task as well. The combination of backtranslations and English as an intermediary language was also observed in Participant C2, but to a lesser degree than in Participant C1. Participant C3 decided to handle all idioms descriptively which was a sign that they are probably not comfortable with or proficient in Swedish idiomatic language, so this was done to ensure there are no literal translations with lost metaphorical meanings. They offered solutions to some elements on their own, without research *(sjekira je pala u med /komu/),* but the majority were handled in the previously described way. Elements *koronašpek*, *šmrcosram* and *kao rukom odneseno* were additionally put into an MT tool and the solutions were then corrected or

paraphrased. The entire finished text in Swedish was put into an MT tool and an English translation was generated. This was the only way they used English as an intermediary language. The participant then made some additional changes and finessed the text before producing the final version of the translated text. The participant completed the task in 29 min 23 sec. The translation and post-editing process of Swedish students was very similar; however, it can be observed that MT was used less often during the translation task, especially MT output generated in English. It is clear that these participants feel that they are more proficient in their second language and that they generally choose to use it as help. Furthermore, an additional reason for the use of English during machine translation might be that it simply produces better output since Croatian is a rather small language and there is more training material for the Swedish-English language pair. It is also noticeable that the English students feel much more confident in their language skills simply because they provided more examples where they produced translations on the spot without any research or aid. This is also what sped up their translations process.

5.3. Questionnaire

After completing the post-editing and translation tasks, the participants were given a questionnaire with five open-ended questions, four of which were related to the completed tasks, while in the last question, the participants could freely comment on the points they found important or interesting. Not all the participants answered the last question. The majority of participants provided detailed answers to the questions, while some chose to comment only on one of the several points brought up in the question. A thorough analysis was conducted on all the responses collected.

5.3.1. Comparison of the post-editing and translation task

The first question in the questionnaire was the following: “Compare the two tasks you have just completed – post-editing and translation. Which one did you find to be easier and which one more difficult? Please explain.” Since the results from previous similar research (Moorkens et al. 2019, Mehmet and Gürses, 2019) have shown that translators find post-editing to be a more unpopular task even though it is often less time-consuming, one might expect the participants to feel the same way. The results are presented below.

Of the 17 participants, eight felt that the translation task was easier to complete. Among these participants, five are English students who completed the tasks in class, one is an English student who completed the tasks remotely and the final two are Swedish students who completed the tasks in class. The participants provided different reasons for choosing translation as the easier task. For example, Participant A3 stated that the translation task was easier because they had the opportunity to start from scratch without the interference from machine translation solutions. They believe that machine translation often makes them think a certain way which is then harder to step out of. This is why they felt the post-editing task was more difficult. Participant A4 expresses the same opinion and further explains that they feel more comfortable translating on their own without the help of a machine translation tool because, in their opinion, they produce a higher quality translation when translating by themselves. They discuss how during post-editing they start questioning their choices and become oriented towards the already existing translation which makes them think that other solutions are not as acceptable. Participant A5 points out that intervening in a completed translation is a more difficult task than translation itself because sometimes it is difficult to decide when something is actually a mistake that needs to be corrected. This is something that Participant A8 also highlights saying that they are unsure whether something is their personal style and preference or an actual mistake. They also state that with post-editing one has to "think like a machine would" to figure out how the machine came up with a certain translation solution. They agree that in this particular case post-editing was a more difficult task to complete, even though translation usually requires more cognitive input.

Participant A6 goes on to explain that the reason they found translation to be easier has a lot to do with the type of text. They say that it is easier for them to simply translate a text that is filled with idiomatic expressions, rather than perform post-editing, because they feel a larger level of freedom in forming sentences. They point out that machine translation can be quite restrictive when it comes to language creativity and that it has more use in translating a more formal type of text. Participant B1 further touches on the importance of the text and says that translation was easier because the text differed greatly in the amount of "intricate language elements" in comparison with the post-editing text, that is, that the post-editing text contained more elements that are commonly heard in idiomatic language, while the translation text included more elements which could be translated freely because they do not have a traditionally established equivalent in the target language.

Among the Swedish translation students Participant C1 stated that the translation task was easier because the text contained more idioms for which they could find an equivalent without doing much research. This again relates to the text being the reason for such an opinion. They also stated that post-editing is usually a less time-consuming task but in this particular case the post-editing text included many complicated elements that they needed to look up. Participant C1 is, interestingly, the only participant who pointed out that time restriction played a part in choosing translation as the easier task. They said that even though post-editing usually takes less time to complete, the complicated elements and time restriction made it more difficult, resulting in translation being an easier task. Participant C3 also agrees that translation was less difficult to complete and names creative freedom as the main reason. They state that post-editing requires a better focus.

What is interesting to note is that four participants specifically pointed out machine translation output as the main reason why they had chosen translation as the easier task and post-editing as a more difficult task, while two participants decided to focus on the text type (quantity of creative elements) and amount of freedom in forming sentences or coming up with new ideas. Even though in this case creative freedom is linked to machine translation output, they did not specifically mention machine translation as a hindrance to their creativity. Another important point to note is that two participants stated that they were unsure as to what constitutes an actual mistake and what can be regarded as their personal style or preference and, therefore, as a preferential change. While this is, of course, a valid concern to have and an important aspect to take into consideration when performing post-editing, in this case it can also be attributed to personal inexperience of the participants in performing post-editing. It is more likely that, during their studies, they have completed more translation tasks than post-editing tasks, so the limits between mistakes and preferences might be blurred. Even though the participants are currently attending a course in post-editing and machine translation quality assessment, the fact that they likely have more experience in translation tasks than post-editing tasks might have also contributed to the fact that translation has been voted as an easier task.

Of the remaining nine participants, four participants stated that post-editing was the easier task to complete. Among these four participants, three are English students who completed the tasks in class and one is a Swedish student who also completed the tasks in class. The reasons for such a decision were more uniform. Participant A1 stated that post-editing required considerably

less creativity and that machine translation helped quite a lot. However, they believe that their translation task is of better quality because many machine translation solutions appeared to be "okay", "satisfactory" or "not bad" so they were left as they were. On the other hand, the translation solutions were subjected to a larger amount of criticism, which made translation a more difficult task to complete. The reasoning behind this is in direct opposition with the reasoning given by participants who have stated that translation is the easier task exactly because it allowed for greater creative freedom. This might simply be the result of different translators' preferences – some translators prefer working with creative material while others enjoy having strict guidelines. This is why a large amount of creativity necessary to complete a task might be an advantage for some and a disadvantage for others.

Participant A2 says that post-editing was easier to complete because the translation task contained many idioms without equivalents in the target language, so they needed to be creative. This also relates to the creativity issue brought up by the previous participant and can simply be the result of different preferences regarding text types. The participants such as Participant C1 or C3 who have stated that a larger number of idioms that do not have a target language equivalent is the reason why they have chosen translation as the easier task might find this a positive aspect, while Participant A2 might see it as a negative aspect. Participant A2 also goes on to say that post-editing is simply an easier task due to it being less time-consuming. Participant A9 said that they found post-editing less difficult because there was already a finished text that they needed to change minimally, while translation was more difficult because everything needed to be translated from scratch and they needed to weigh each word they used. Participant C2 agrees and says that having some kind of material to change is much better than starting from scratch. They point out that translation requires more cognitive effort and concentration. One more factor which contributed to translation being a more difficult task was that the class computer did not have a Swedish keyboard installed and there was not enough time to download it. They also state that it is much easier for them to see the mistakes and correct them when doing post-editing than it is when translating. The last point is a contradiction to what Participants A5 and A8 stated. These participants pointed out that it was more difficult to realize what was an actual mistake and what was their personal preference when performing post-editing. Participant C2 is the only participant who pointed out that it was the opposite for them and that machine translation helps them see the bigger picture and come up with different translation solutions.

There were also three participants who stated that both tasks were equally difficult to complete. Participant A7 also mentioned that, usually, translating from scratch was easier than post-editing, but this particular text which needed to be translated contained many culturally specific idioms that they needed to research. In the post-editing task, however, these idioms had already been translated which made the whole task a bit easier. On the other hand, they found post-editing demanding in itself because it was difficult to see the bigger picture and not think about the solution already provided. Taking into consideration all these points, they decided that the tasks required an equal amount of cognitive effort. Participant B2 stated that they usually find post-editing easier because it requires less cognitive effort. However, since both texts were heavily focused on idioms, machine translation output provided no help at all. Therefore, completing both tasks actually came down to researching idioms and neologisms, making both tasks equally difficult. Participant A10 only stated that both tasks were equally difficult and that they felt no difference in cognitive effort while performing them.

All of the aforementioned participants could be organized into groups based on their answers regarding the difficulty of each task. However, there were two participants who could not be assigned to any of the previous groups. One is an English student who completed the tasks in class and the other is a Swedish translation student who completed the tasks remotely. Participant A11 pointed out that, when translating, they usually use Google Translate to translate the whole text and then they perform post-editing. This means that they performed post-editing in both tasks. However, they stated that the translation task was easier to complete because, in their opinion, the text contained fewer elements that required creativity. Participant D1 also performed post-editing in both tasks. They pointed out that, had they not used translation tools, they would have performed post-editing faster, but that the task would not have been necessarily easier. It is interesting to note that both participants do not automatically define post-editing as the easier task, even though it is obviously their preferred method of dealing with the text. Participant A1 who has already stated that for them post-editing was the easier task, was also one of the participants who performed post-editing in both tasks. However, since they clearly stated which task they perceived to be easier, unlike the previous two participants, they were not sorted into this group.

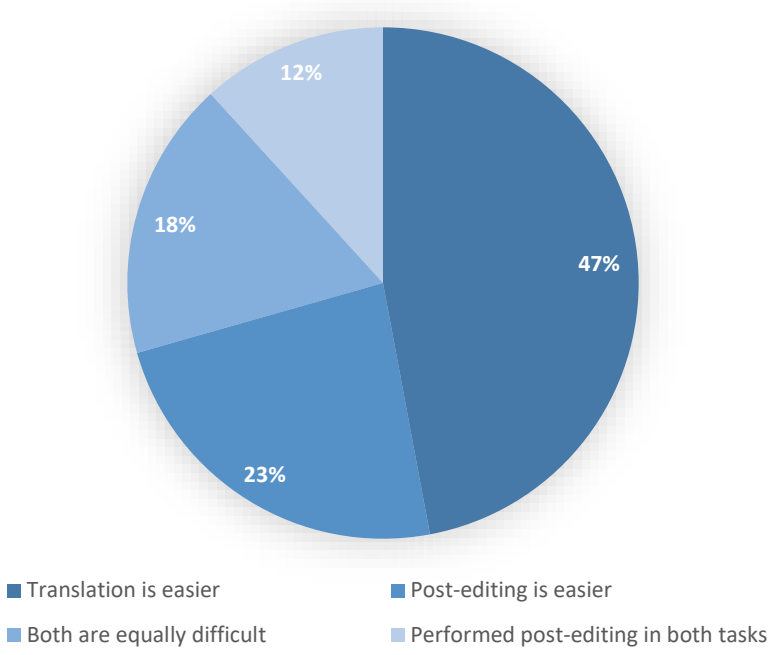

Figure 1 – Post-editing vs. translation in terms of difficulty

5.3.2. Effect of machine translation

The second question in the Questionnaire deals with the effect of machine translation on creativity. The participants were asked to comment on the amount of help or hindrance that machine translation provided in completing the tasks, focusing especially on elements that required a creative approach. All participants agreed that machine translation did not help them in a significant way. However, they gave different answers and explanations regarding the amount of hindrance they experienced. Participant A1 starts off by saying that machine translation hindered their completion of the tasks because the provided translations of creative elements generally made no sense. They continue by pointing out that some translations of idioms contained incorrect prepositions which caused much confusion and took more time to correct. They conclude by stating that it would have been better if they had not had the provided solutions. Participant A2 agrees and adds that machine translation made the tasks more difficult because it could not translate the creative elements in a satisfactory way. The output included literal translations which could not be used and made no sense. Participant A3 says that machine translation has not been shown to be a particularly useful tool in dealing with metaphors, idioms, proverbs and other

elements that require creativity. They believe that, when it comes to creative language, it actually makes the task more difficult because the person cannot stop thinking about the provided solution and, as a result, cannot achieve the required degree of creativity. A negative effect on creativity is a point that participants mention quite often. Participant A4 also agrees that machine translation provided no help because it translated all idioms literally. Even though other non-creative elements were translated in a satisfactory way, the fact that the participant had to research all other creative elements and decide whether they were stylistically correct and carried the accurate meaning took a lot of time and effort. Participant A4 believes that the creative component is something that a machine will never be able to achieve and why it is useless to rely on it in dealing with similar texts.

Participant A5 agrees and states that idioms and neologisms were elements that they needed to research on their own, because machine translation provided no help. Participant A6 starts on a positive note and says that on the one hand machine translation gave them ideas and a base for further research of creative elements, but on the other hand it took up a lot of their time because each translated element had to be checked for accuracy and, in a majority of cases, replaced with a better solution. They believe that it would be less time-consuming to translate from scratch. Participant A7 agrees with everything previously mentioned and adds that machine translation is very useful in translating all other elements other than creative ones. They also mention that due to time restriction they could not check all creative output that machine translation provided, which would not have been necessary if they had translated from scratch. Participant A8 states that machine translation was misleading in many cases because it provided literal translations and that figurative language is handled best by translating from scratch. Among English students who completed the tasks at home, Participant B1 clearly states that they did not use machine translation in the translation task and that it provided no help in the post-editing task because the creative elements were handled literally. However, they point out that some creative elements required no intervening. Participant B2 strongly disagrees with the use of machine translation in any kind of creative text, highlighting that they have never seen a machine translation in which idioms were recognized as such and translated in a way that was not literal. They state that saying that machine translation provided no help would be an understatement. Participant A9 says that machine translation neither helped nor hindered their completion of the tasks. In both tasks the participant simply skipped over the creative elements that machine translation handled and looked for

potential solutions themselves, aware that it is useless to expect a machine to handle these elements adequately. A positive comment regarding machine translation can be found in Participant A10's answer. They point out that machine translation provides help by offering terminology they would not have come up with themselves, that is, without doing some research. However, when it comes to creative elements, they again emphasize that machine translation handled them literally. In many cases this was very easy to spot and correct, so not much time was lost in the editing process. Something that the other participants did not point out is that machine translation sometimes follows the source language syntax too closely which becomes an issue for the participant. They waste much time deciding whether the provided sentence is correct or whether it requires intervening. Nevertheless, machine translation makes the process faster overall and, according to participant A10, is especially useful in situation with time restriction. Participant A11 also finds some positive aspects of using machine translation. They say that the first, literal solution that it provided helped them in coming up with other solutions or offered a basis for further research. However, it was not useful at all in translating neologisms and metaphors. Participants who completed the tasks in their L2 agree that machine translation predominantly has a negative effect on their creativity, with the exception of a few cases in which it provided a "base" for further research or sparked some ideas. When positive features of machine translation were mentioned, it was not about the creative elements, but about the surrounding text. The creative elements were handled literally and each individual participant had to correct these translations and spend their limited time doing it. Making it harder for the participants to think outside the box seems to be the main feature of machine translation effect.

There are some differences in comments given by participants who completed the tasks in their L3. Participants C1 builds on the previous comments about machine translation providing the basis for further research and giving initial ideas about the possible solutions. However, the negative aspect is that it was harder for the participant to drop the solution and look for different ones because they were tempted to mark the machine translation solution as satisfactory and move on to different elements. This further emphasizes the previously mentioned point that machine translation complicates the tasks because it makes the participants hesitate when deciding that a potential solution is actually a mistake. Participant C2 provides a different point of view and says that thanks to machine translation they do not have to worry about spelling or grammar so they get to focus more on being creative or researching complicated points in the text (idioms, proverbs,

culturally marked elements). This is a very unique point of view that none of the participants mentioned. Participant C3 shares the positive experience and says that tools such as Google Translate help them realize their own mistakes made in a hurry. They also say that machine translation helps them find appropriate synonyms and acceptable terms. It has to be noted, however, that all of these positive aspects mainly refer to elements which do not require a creative approach, but it is interesting to notice that some participants chose to comment on the negative aspects, while some decided to cover predominantly the positive ones, while also highlighting that in particular instances machine translation provided no help. Participant D1, however, clearly states that a machine translation of a creative text is basically useless, stating that it provided a satisfactory translation for a single element out of many. They point out that much time was wasted trying to correct such a translation and that it would have been less time-consuming to start from scratch.

5.3.3. Future use of MT by participants

The third question ("Would you use machine translation in the future when dealing with a similar type of text? Why? If yes, in what way?") is meant to give more insight regarding the usability of machine translation. It is interesting to look at whether participants who pointed out the negative effects machine translation had on the completion of tasks still decided to use it in the future. The answers were mixed. Participant A1, who has criticized the literal translation of creative elements that MT provided, says they would still use MT as a help for parts of the text which do not contain creative elements. Taking it further, they actually performed post-editing in their translation task as well. They believe that, when it comes to elements which require a large amount of creativity, it is better to start from scratch and build on it with the help of tools like dictionaries or Sketch Engine. This is an interesting point of view because they used a machine translated text during their translation task. Participant A2 goes a step further and says that they would not use machine translation, which is in line with their previous answers. They point out that using machine translation makes no sense because all it can provide is a literal translation, and neologisms or culturally specific elements require a broad cultural knowledge, so MT cannot provide a satisfactory solution. Participant A3 feels differently. They believe that machine translation can help with completing the task quicker and they would also use it with a similar type of text. They point out, however, that the potential problem might be the fact that creative elements

would be translated literally. In such a case they would start translating from scratch but would still like to see the MT solutions in case it inspired them to find an appropriate solution. This answer is quite surprising given that the participant criticized MT saying that its solutions actually had a negative effect on their creativity and that it was more difficult to stop thinking about the MT solution and see the bigger picture. Participant A4 shares the opinion of Participant A2. They say they would not use machine translation when dealing with a text that contains many creative elements or with any text that requires a lot of creativity. They believe that it is a useful tool when it comes to texts that can be translated literally, but that it is not meant to be used in a creative context. Their answer also matches their opinion from the previous answer – they recognize the negative aspects of MT and would not use it at all. Participant A5, who stated that MT actually made it harder to complete the tasks, would still use it when dealing with similar texts, but would be very aware that those solutions would not be satisfactory and would require much intervening. Participant A6 says they would not use MT with similar texts because they like to have a "blank page" when dealing with texts that require creativity. They point out that MT has a negative impact on creativity and restricts the person's thought process. They might potentially use it if they struggle with creating solutions. This answer is particularly interesting given that this participant stated that MT gave them ideas and directed them in their research, but that they also lost a lot of time checking every MT solution. Participant A7 says that they would absolutely use MT because it makes the tasks easier. They point out that although its translation of creative elements is unusable in a majority of cases, it is still a good source of inspiration. They would not put an entire text into an MT tool, but they would use it for individual elements. Participant A8 says they would use MT only when they could not come up with a solution themselves or to be faster if they needed to finish a task quickly. They also would not put the entire text in an MT tool but they point out that just translating from scratch and not using MT when you get stuck would be stupid because it can provide help in terms of inspiring ideas for further research. Their answer is what one would expect based on their previous comment about MT not being particularly useful when it comes to creative elements. Participant B1 also agrees that they would use MT when they run out of ideas, but also point out that other tools such as AI, namely Chat GPT, might also be useful in offering ideas for solutions. This was tested by one of the participants, and Chat GPT was indeed helpful. Participant B2 says that that they would not use MT at all because, as they already said, it provides no help whatsoever. It is interesting to notice that out of all English students only four commented

that they would not use MT in any way because it provided absolutely no help, while other students said that they would use it, with three of them saying that they would use it even for creative elements. Six participants who stated that they would use MT, would use it despite previously stating that MT provided little to no help in completing the tasks. They also gave some conflicting comments about MT helping with creativity, while hindering it at the same time. One might suggest that seeing an MT solution which is not usable might be a help in itself and that this is why some participants would not completely disregard the use of MT as it might provide an "invisible" kind of help.

Among the non-translation English students, participant A9 states that they would use MT to shorten the time necessary to figure out sentence structure, tenses, word order or some simple phrases, but that one must keep in mind that each individual's creativity is the most important aspect and that one should not rely on MT translations when it comes to creative elements. So, they would use it even with a text filled with creative elements, but they would discard the creative solutions. Their answer is completely in line with their comment about skipping the creative solutions while completing the task and matches what they said about MT providing help with the remaining text. Participant A10 would also use MT, but they point out that its solutions regarding creative elements actually spark some interesting ideas which they use for further research. They use them as a starting point and build on from there. This is also an expected answer based on their previous comment about MT providing the base for research. It is also expected from participant A11 to use MT, because they stated that, when dealing with translations, they usually put the entire text into an MT tool and perform post-editing. With that in mind, they point out that after doing this, a detailed post-editing must be done because MT cannot recognize creative elements and translates them literally. In this group, all participants would use MT but would not pay much attention to creative elements because they are aware that they are usually not translated well.

Among the Swedish translation students, participant C1 says that they would use MT not only to help with the text, but to also save time on translating non-creative elements so that they could focus on creative ones and spend more time searching for an appropriate solution. It is an expected answer because they previously stated that MT provided a base for further research of creative elements. Participant C2 points out that they would absolutely use MT, followed by detailed post-editing, exactly because it offers more space to be creative. This is one of the rare examples of a participant saying that MT actually helps with their creativity. Participant C3 says

that they would also use MT, because it is a tool meant to help and not provide the ending solution. If one thinks of it in these terms, it can be of great help. Participant D1 says that they would use MT if they dealt with a translation into their L2/L3 because it offers a base with which to work. However, they believe that texts with such intricate elements should be handled by someone who is a native speaker and in such a case, MT would not be used. This is an interesting comment which highlights that translation into your L2/L3 might make one use MT while in a reverse case MT would not be an option. Relying on MT for help is more likely when there is a certain level of inexperience or lack of confidence in one's own skill. This is highlighted well in these comments. Among students who translated into their L2, four would not use MT in any case. All other students, especially students who had to complete the tasks in their L3, would use MT and believe it provides help even when they recognize these solutions as bad.

5.3.4. Use of MT when working into L2/L3

The fourth question deals with the difficulties of post-editing/translating into L2/L3 versus post-editing/translating into L1. The participants were asked to compare the tasks they completed as part of this research with the tasks they had already done as part of the course, which dealt with post-editing/translating into L1. They needed to comment on the way MT provided help or hinderance in translating into L2/L3 and whether they would use MT in the future when dealing with translations into L2/L3. Before the analysis, it is important to note that not all participants provided all the information required in this question.

Participant A1 says that machine translation is useful when translating into a language that is not your native because this is generally more difficult so having the help that MT provides is quite useful. They go on to say that some translation solutions do not come to us as naturally as they do in our native language, so MT speeds up the process of translating and helps with coming up with potential solutions. Participant A2 does not change their opinion and says they would not use MT when translating into L2 for the same, previously stated reasons (MT provides no help, only hinders the process). Participant A3 points out that due to the complexity of the Croatian language system and a low level of competence that MT has in translating both into and from Croatian they believe MT would only make the process more difficult. They go on to explain that even though it quickly provides solutions which could be useful with additional changes, MT cannot provide a satisfactory result, especially in texts that rely heavily on some typically Croatian

aspects (like freedom in word order). They believe that having MT solutions only restricts the thought process which becomes an issue when the translator needs to create a distance between the source text and the translation in order to come up with acceptable solutions. Participant A4 states that MT did not help them in a significant way in any of the translations they have done when it comes to creative elements. It did, however, help with translations of EU legislation done in class where standard phrases are used, for which it provides quality translations. Participant A5 believes that MT performs better when translating from Croatian into English than vice versa and that the best one is usually Google Translate. They would use MT but would carefully inspect the text for any mistakes. Participant A6 comments that MT is useful when translating both into L1 and from L1, but even more so when translating from L1 because it stops the translator from potentially making grammar mistakes they would fail to notice. They would use MT when translating both from L1 and into L1 depending on the type of text and style. The criteria for MT use would not be the direction of translation. Participant A7 believes that MT offers more help when translating into English than into Croatian. As far as they can remember it has never made translating more difficult, but it is important to use it carefully. They would use it in the future.

Participant A8 is a student of both English and Swedish. They point out that translating from English into Croatian is more difficult because they find it much easier to express themselves in English since they read and write in English much more often than they do in Croatian. However, when it comes to their L3, they state that translating from Swedish into Croatian is significantly easier than vice versa. They are more confident in their skills in Croatian than in Swedish which makes translating in this direction easier. They would use MT when translating into their L2 and L3, but especially into their L3 since they do not have the same level of creativity that they do in their L2 or L1, but they would spend a lot of time editing the translation. Participant B1 points out that MT usually does a better job when translating from Croatian into English than vice versa, probably because there is a larger amount of data for training it. They are a supporter of using MT as a translating aid. Participant B2 states that MT has been helpful up until now because they have usually dealt with texts that did not include a large number of creative elements (such as manuals or newspaper articles). They say that they expected the quality of the output to be worse than it was because they usually translated into Croatian, but that MT actually offered more help than they had expected. They agree with participant B1 and highlight that translating into English should be easier for an MT tool due to the size of the corpus and training material, so that is why

they would use MT in the future when translating into L2, but they would not use it for creative translations.

All but one participant (A2) in the English translation student group would use MT in the future when translating into L2 or L3. They again pointed out that MT is quite lacking when it comes to creativity, but that it is very useful with all other types of texts. The majority of the participants highlighted that MT offered help with previous translations, but that these texts did not contain a large number of creative elements. All but one participant emphasized that translating into L2 is more difficult and that they would use MT in such cases. Some participants also tried to explain why they believe that MT performs better when translating from Croatian into English and highlighted the amount of training data as the main reason. It is interesting to note that almost everybody actually uses MT and is not opposed to using it. However, for some the main factor for deciding to use MT is text type, while for others it is the direction of the translation.

Participant A9 says that translating into L2 is definitely more difficult than translating into L1 but that they would use MT in both cases. Participant A10 agrees and points out that translating into L2/L3 is more difficult because they are unsure of their own linguistic competence, so MT serves as a great starting point or a way to check some of their own solutions. They would also use MT in both directions of translating. Participant A11 again points out that the quality of MT output is better when it comes to translating into English because it is a global language and they would absolutely use it in such cases. They point out that MT is useful because it offers help with English syntax and words they cannot immediately remember, which is why it makes translating quicker. There are no differences in their comments and the comments of English translation students.

Among Swedish translation students Participant C1 points out that MT helped them significantly when translating into L3 because the levels of their linguistic competence are not the same in L1 and L3. It was much more complicated to come up with translation solutions in L3 and decide whether these solutions are satisfactory. They lack confidence in their L3 knowledge and prefer to use MT to compensate for it. Participant C2 would also use MT when translating into L3 because, again, they are unsure of their linguistic competence. When they use MT in such cases, they are more likely not to make a mistake and they say that they sometimes learn new expressions and it helps them recognize what is correct and incorrect, what is stylistically better or worse. Participant C3 points out that they usually use English as an intermediary language when translating into their L3, that is Swedish, because MT is still underdeveloped when it comes to

direct translations from Croatian into Swedish. They say that MT has helped them with previous translation tasks. Participant D1 agrees that MT is helpful when translating into L3 but only if the text contains no creative elements. They would use MT in the future to translate into L3.

What is interesting to note is that three of the four Swedish translation students pointed out their lack of linguistic competence when it comes to translating into L3. It is clear that the use of MT depends on each individual's confidence in their knowledge, so participants who translated into L2 would in most cases use MT, but not for creative elements, while almost all Swedish translation students would use MT regardless of the text type, simply to ensure that they do not make a mistake. The factors that determine whether someone uses MT are text type, creativity, linguistic competence and direction of translation.

5.3.5. Other comments

Question five urged the participants to comment on whatever they wanted that has not already been highlighted. It was an optional question, so only seven participants provided comments. Participant A2 highlighted that when dealing with texts with many creative elements it is useless to employ the help of an MT tool because it will only waste our time and hinder the process. They say that the translation will be of a much better quality if we simply translate from scratch. Participant A3 states that MT is getting better as a translation aid, but that it should develop even more to make post-editing faster. They believe that it will never be able to achieve the quality of a human translation. They highlight that humans should use MT as an aid in translating and not as a means or tool for translating. Participant A8 points out that they did not use Google Translate but Glosbe as help because it provides context and cites the source of the translation which is helpful in determining whether a solution is reliable or not. Participant B2 highlights once more that they have never seen an MT tool recognize and translate and idiom in an acceptable way. Participant A9 points out that they did not know Croatian could be so creative. Participant A11 emphasizes that after using MT it is incredibly important to perform a detailed post-editing to make the text satisfactory on a stylistic level. Participant D1 also mentions that it is important to use MT as an aid to save up time, but not for all types of texts. They also point out that no AI will ever achieve the level of quality that human translations have.

6. Conclusion

The objective of this research was to find out the way in which students translate when it comes to creative elements and what role, if any, machine translation plays in the process. Since MT is a widely used and easily accessible tool which has only got better and improved the quality of its output in recent years, one might expect that students would use it as an aid, especially because they still lack experience in the field of translation and might wish to find some form of reassurance for their translations. The paper also aimed to investigate what kind of impact, if any, machine translation has on creativity and whether the participants would use it in the future while dealing with similar texts. Since translating creative language is something that MT tools have not quite mastered, it was interesting to look at the post-editing and translation processes of the participants and their answers as to what role MT actually played.

In the post-editing task, all of the participants recognized that MT output provided literal translations, with no regard for metaphorical meaning, making the translations of creative elements largely unusable. The only acceptable solutions were that of neologisms (*koronaš*, *koronakriza*, *superširitelj*). Out of the 14 participants who provided videos of the tasks, five participants (two students of English and three students of Swedish) used additional MT during the post-editing task. The discrepancies are great. Taking into consideration what the participants disclosed in the questionnaire, it can be deduced that the reasons for using additional MT is related to one's self-confidence regarding their language competence. This played a part in the translation task as well. During the translation task six of the 11 students of English did not use any MT tools, two used it on some elements, and three performed post-editing. All students of Swedish relied heavily on MT use. It is interesting to note that even after seeing the bad results that Google Translate produced during the first task, almost half of the participants decided to use it again, some even deciding to perform post-editing, which was voted as a more difficult task. It seems that even if it produces unusable results, some participants still opt to use MT in their translation process. The participants (A1, A9, A11) who performed post-editing in both tasks did not necessarily believe that post-editing is easier. Two of them actually found it more difficult, while Participant A1 stated that it was easier. However, all three pointed out that MT did not particularly help them, but that it also did not hinder their creative process and that they would still use it in similar cases with detailed editing. Participants A5 and A7 who used MT as aid during the translation process also agree that it was not very helpful, but that it overall makes the job easier so they would definitely

use it in the future but with detailed and careful editing. The participants who did not use MT decided to do so because they had seen that it provided them with no help during the previous task and made the completion more difficult. Two participants would however still use it if they worked on a translation with time restriction or to translate everything else but the creative elements. Other participants would not use it since it hindered their creativity.

Machine translation use and its importance is even more evident with students of Swedish. Since they were completing the tasks in their L3, the aid of MT was something that they made use of very often. They used it in the post-editing task and during the translation task in combination with their L2 as an intermediary language. MT was used for all creative elements, for the surrounding text and even to help the participants with translating Swedish into English (intermediary language) and then into Croatian (or vice versa). It is clear from their answers that the impact on creativity was a more positive one in comparison with the students of English and that even future use of MT was not being questioned – they would absolutely use it, especially in ways they have displayed during these tasks. Of course, the reasons for such discrepancies are related to translating into L3. According to their own words, the participants lack the skills and competence to efficiently translate into their L3 and this affected the completion of the tasks. They recognized that MT provided literal translations which were unusable, but it often sparked an idea or offered inspiration to look for other solutions. Those new solution would then again end up being translated by MT into either an intermediary language or target language. It is safe to say that the effect it had on the overall completion of the tasks was a positive one in the participants' opinion. However, in the post-editing task they again had difficulties with deciding what to categorize as a mistake and what as a stylistic choice or personal preference.

The results of the experiment are consistent with previous research on the topic (Moorkens et al. 2019, Mehmet and Gürses, 2019). Even though there were some participants among students of English who pointed out that literal machine translations can sometimes trigger an idea or offer inspiration, which was obvious in the videos, they all stated that it always had some kind of an effect on their creativity – sometimes a positive one, but in most cases a negative one. This is also one of the main reasons why the participants found post-editing more difficult – the inability to step away from the offered solution proved to be a big issue and, coupled with their general lack of self-confidence in deciding what is an actual solution and what is just personal preference, it leads to the conclusion that there should be more resources available which will teach students

how to more easily post-edit a machine translation. This is especially important now that an increasing number of translation companies decide to offer services of machine translation post-editing and when companies believe that even creative texts, for example in the field of marketing, should be post-edited rather than translated. Translation from scratch was overall more idiomatic rather than descriptive, but, since a large number of participants pointed out that they were unsure of their post-editing skills, this might be a field in which improvement is needed. Keeping up with technological discoveries and improvements is important in this field of work and students should be equipped to handle all kinds of tasks after graduation – even the ever-increasing number of post-editing tasks.

In conclusion, even though neural MT tools have significantly improved machine translations overall, they are still not able to replace humans and deal with connotative meanings. While there is research which proves that steps can be taken in this direction and that MT tools trained for a specific purpose and on specific texts can greatly improve the quality of MT output and speed-up the post-editing process, the joy of translating is still something that humans will not give up on.

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8. List of figures

Appendix 1

SOURCE TEXT IN CROATIAN

Svi znamo da u našoj državi sve funkcionira po principu „ruka ruku mije" te da već duže vrijeme vlada džepoljublje, a ne rodoljublje. Stoga ne iznenađuje da se državnom vrhu upalila lampica i da su u jeku koronakrize državnu blagajnu odlučili napuniti onako kako se kod nas jedino zna i umije – turizmom. Barem je nekome šaka puna brade. A čini se kao da smo još jučer promatrali koji je grad prvi na crnoj ljestvici po broju koronaša i superširitelja.

ENGLISH MT TRANSLATION FOR POST-EDITING

We all know that in our country everything works according to the principle of "hand washes hand" and that for a long time, love of the pocket has been ruling, not love of the nation. Therefore, it is not surprising that a light bulb went on at the top of the state and that in the midst of the corona crisis, they decided to fill the state coffers in the way they only know how to do in our country - with tourism. At least someone has a fist full of beards. And it seems like only yesterday that we were looking at which city is the first on the black list in terms of the number of corona people and super spreaders.

SWEDISH MT TRANSLATION FOR POST-EDITING

Vi vet alla att i vårt land fungerar allt enligt principen "hand till hand" och att det länge har fått fickpengar, inte patriotism, att styra. Därför är det inte förvånande att en glödlampa tändes högst upp i delstaten och att de mitt i coronakrisen bestämde sig för att fylla statskassan på det sätt som de bara vet hur man gör i vårt land - med turism . Någon har åtminstone näven full av skägg. Och det verkar som bara igår som vi tittade på vilken stad som är först på den svarta listan när det gäller antalet coronamänniskor och superspridare.

TEXT FOR TRANSLATION INTO ENGLISH/SWEDISH

Oni kojima je sjekira pala u med jer su napustili lijepu našu, željno iščekuju ponovno otvaranje granica. I dok jedni bacaju drvlje i kamenje po stožerašima, drugi računaju koliko će pčela pohrliti

na med, jer ipak je produženi vikend. Jedino što gostima može pomrsiti planove jest loša figura zbog nakupljenog koronašpeka. Srećom, naša je obala puna privatnih plaža gdje vas nitko ne ometa pa takvi problemi nestaju kao rukom odneseni. A nakon kratkog povratka u staro normalno opet nas čekaju maske, razmak i šmrcosram.

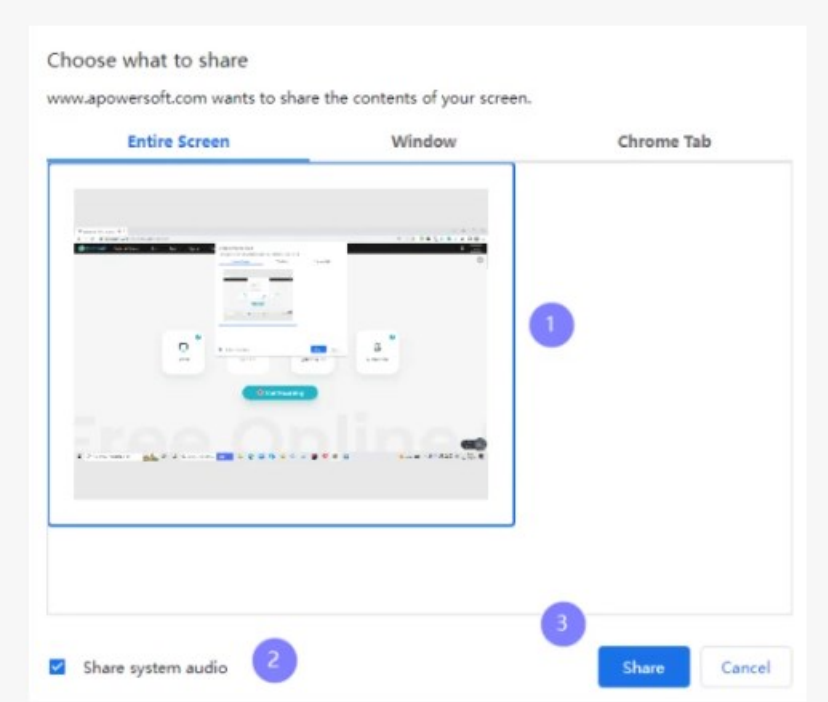
Appendix 2

POST-EDITING AND TRANSLATION TASK INSTRUCTIONS

Poštovani/poštovana,
Ovaj se zadatak sastoji od dva dijela. Na samom početku dobili ste papiriće sa šifrom. Na poleđinu je potrebno napisati studijske grupe i smjer.

1. dio

Dobili ste izvornik na hrvatskom jeziku i strojni prijevod na engleski jezik (ili L3). Vaš je zadatak redigirati engleski tekst (ili L3) služeći se bilo kojim pomagalom. Prije nego što započnete s redakturom na sljedećoj poveznici pokrenite snimanje zaslona: https://www.apowersoft.com/free-online-screen-recorder (odaberite Start recording, a zatim Entire screen i Share; nije potrebno dijeliti zvuk).



Nakon što završite sa zadatkom, zaustavite snimanje i spremite datoteku koju ćete nazvati prema šifri s papirića i dodati slovo R (npr. 12345_R). Word datoteku nazovite jednako. Vremensko ograničenje ovog zadatka je 30 min.

2. dio

Dobili ste tekst na hrvatskom jeziku koji je potrebno prevesti na engleski (ili L3). Pri prijevodu se smijete služiti bilo kojim pomagalima kojima se inače služite. Prije prevođenja pokrenite snimanje zaslona jednako kao za prvi dio zadatka. Nakon što završite sa zadatkom, zaustavite snimanje i spremite datoteku koju ćete nazvati prema šifri s papirića i dodati slovo T (npr. 12345_T). Word datoteku nazovite jednako. Vremensko ograničenje ovog zadatka je 30 min.

Kada završite zadatak, molim Vas da detaljno odgovorite na pitanja koja ste dobili. Ako želite, možete pogledati snimke koje ste spremili.

Hvala na sudjelovanju!

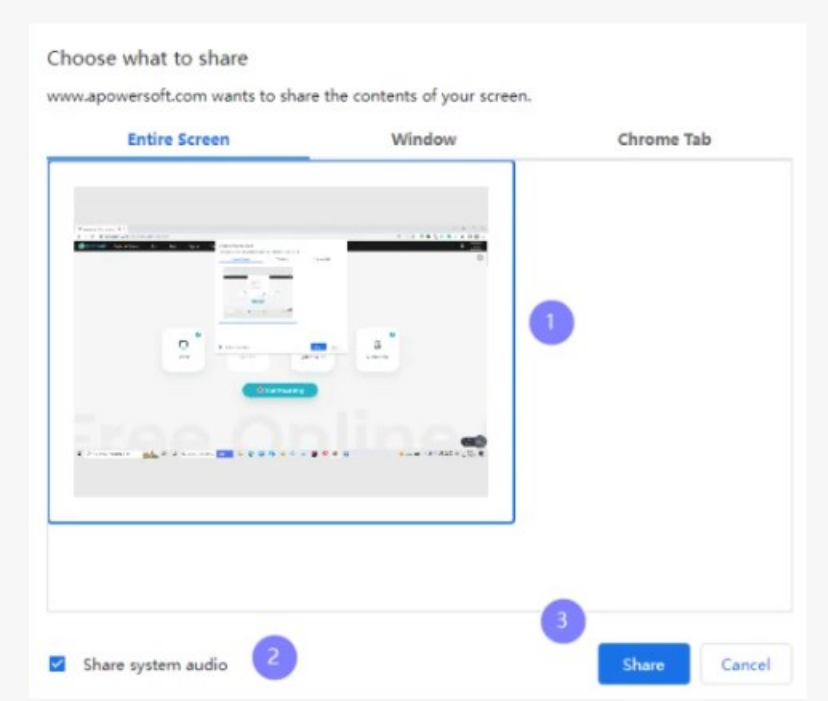
POST-EDITING AND TRANSLATION TASK INSTRUCTIONS (Author's translation)

Dear all!

This task consists of two parts. At the very beginning, you will receive pieces of paper with a code. Please fill in your graduate program on the back of the paper.

Part 1

You have received the source text in Croatian and a machine translation into English (or L3). Your task is to post-edit the English text (or L3) using any tools you have at your disposal. Before you start the post-editing process, please activate the Screen Recording software at the following link: https://www.apowersoft.com/free-online-screen-recorder (select Start recording, then Entire screen and Share; no need to share audio).



Upon completion, stop the recording and save the file. Please name the file according to the code on the piece of paper and add the letter R (e.g., 12345_R). Please use the same name for the Word file. The time limit for this task is 30 min.

Part 2

You have received a text in Croatian that needs to be translated into English (or L3). When translating, you may use any tools you normally use. Before translating, activate the Screen Recording software the same way you did in the previous task. Upon completion, stop the recording and save the file. Please name the file according to the code on the piece of paper and add the letter T (e.g., 12345_T). Please use the same name for the Word file. The time limit for this task is 30 min.

Upon completion, please answer the questions you were given in detail. If you want, you can view the recordings you have saved.

Thank you for participating!