Machine Translation in Translator Education

La traducción automática en la formación de traductores

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Abstract: With the improvement of free, next-generation machine translation software based on neural networks, Departments for Translation Studies are faced with the question of how to react to this new reality. Translator education programmes should include these and other tools that can complement human translation. However, in order to design activities that incorporate this software, we need data and experience that can serve as a starting point. For this purpose, we have conducted an experiment in a General Translation class and a Specialised Translation class. This article shows the results of this research, including both the quality of the translated text and the students' impressions.

Key words: machine translation; translator education; translator training; translation curriculum; post-editing.

Resumen: Con la mejora de los programas gratuitos de traducción automática de última generación basados en redes neuronales, los Departamentos de Traducción se enfrentan a la cuestión de cómo reaccionar ante esta nueva realidad. Los programas de formación de traductores deben integrar estas y otras herramientas que puedan complementar la traducción humana. Sin embargo, para diseñar actividades que

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incorporen este software, necesitamos datos y experiencia que puedan servir como punto de partida. Para ello, hemos realizado un experimento en una clase de traducción general y otra de traducción especializada. Este artículo presenta los resultados de esta investigación, refiriéndose tanto a la calidad de los textos traducidos como a las impresiones de los estudiantes.

Palabras clave: traducción automática; formación de traductores; enseñanza de la traducción; currículum de traducción; posedición.

1. INTRODUCTION

The release of modern machine translation (MT) programmes, such as the recent neural version of Google Translate (2016), and especially the appearance of DeepL (Plass-Fleßenkämpfer 2017), have initiated many discussions in translation education institutions and have generated insecurity regarding the most suitable attitude towards these programmes in translation training. Positions among translator trainers vary from complete rejection to considering them a valid, modern technological tool open to all students.

Regardless of instructors' opinions, these programmes are here to stay and force translation teachers and institutions to take a stance towards these new developments and find an honest and sustainable manner to deal with these new tools. In the long run, we expect that translator education programmes will have to be adapted to this new reality (cf. Mellinger 2017, 290).

This development of MT has raised speculation even outside the translation industry. On November 28, 2018, the German Federal Association of Interpreters and Translators (*Bundesverband der Dolmetscher und Übersetzer, BDÜ*) responded to a statement by a German politician who had predicted that soon many industries would disappear because of artificial intelligence and technological advances using the example of translators and interpreters. The BDÜ underlined that although the working conditions are changing because of digitalisation and the progress in the area of artificial intelligence, translators and interpreters would know how to adapt to this kind of developments as well as use these technical tools (cf. BDÜ 2018).

It is, however, necessary, to conduct research in the classroom to provide data that can serve as a basis for informed decisions to adapt translator education to new challenges, which was our motivation to carry out the present research.

Over the past months we have observed that students occasionally use MT software to complete set translation tasks. Our first impression was that they used the software in a manner that a non-professional user would, i.e. with little or no textual analysis, research or proofreading. In order to find proof for and/or against this assumption, we set up this case study in two of our translator education courses to gather evidence of how students approach a translation task when they are permitted to use machine translation software.

2. THE EVOLUTION OF MACHINE TRANSLATION

This chapter focuses on the evolution of machine translation in different areas. We will refer to machine translation (MT) or automatic translation as the translation carried out by a computer, and this has to be distinguished from computer-assisted translation (CAT), which is a human translation carried out with the aid of software.

2.1. *Some remarks on the history of machine translation*

The history of computer-assisted translation (CAT) and machine translation (MT) dates back to the 1930s, when the French-Armenian Georges Artsrouni and Russian Petr Troyanskii applied for patents for «translating machines». Between 1947 and 1954, a lot of research was conducted on how to use computers as aids for translating languages, and in 1954 there was the first public demonstration of the feasibility of MT. However, the report published in 1966 by ALPAC, the Automatic Language Processing Advisory Committee, showed that MT was «slower, less accurate, twice as expensive as human translation and that there was no immediate or predictable prospect of useful machine translation» (Hutchins 2005, 2).

The ALPAC report signalled the virtual end to MT research in the United States. Furthermore, it had an impact in the Soviet Union and in many parts of Europe. However, research continued in Canada, France and Germany. In the 1960s, MT was mainly used for translations between English and Russian in the US and the Soviet Union, especially for scientific and technical documents. In the 1980s, various MT system types emerged and there was a market for cheaper MT systems. The turning point in the history of MT was in the early 1990s, when methods based on corpora of translation examples were developed and more research was carried out in the area of speech translation. These trends continued in the late 1990s and early 2000s as there was a growth in automatic translation for direct internet applications (Hutchins 2005, 4).

Up until the 1980s, there were mainly *rule-based machine translation* (RBMT) engines. The creation of grammatical rule sets for source and target languages was the idea behind this kind of MT. RBMT works like a converter between the languages based on these rule sets. With a generic content and simple sentence structure, this concept works well. However, if new content and new language pairs are added, it becomes more error-prone, and maintaining the rule set is very time-consuming and expensive (Bessenyei 2017).

In the late 1980s and early 1990s, interest shifted towards *statistical machine translation* (SMT). Statistical models are created by analysing aligned source-target language data and are then used for the generation of the translation. According to Bessenyei (2017), the advantage of SMT is «the automatic learning process and

the relatively easy adaptation by simply changing or extending the training set». He also mentions the challenge of SMT, namely the creation of «a usable engine and a large database of source-target segments». Due to the fact that SMT is not language independent, it is sensitive to the language combination and grammatically rich languages are difficult to deal with (Bessenyei 2017).

As a remedy for this limitation *neural machine translation* (NMT) was developed. Due to the fact that NMT looks at a sentence as a whole, it can create associations between the phrases. NMT outperforms SMT with regard to fluency and an improved grammatical correctness (Bessenyei 2017).

NMT seems to have displaced the previous types of MT in the past few years. In 2015, neural machine translation became «the new state of the art» and, within a short time, the «entire research field of machine translation went neural» (Koehn 2017, 6).

The pace of the progress of neural machine translation has increased drastically. According to Koehn (2017), there already are and will be even more explorations in the future «ranging from core machine learning improvements such as deeper models to more linguistically informed models» (Koehn 2017, 6).

Even though machine translation engines were developed for commercial purposes during the first decades, nowadays, there are also many that are accessible as free online tools for everyone. Among these, for many years, the most popular software was Google Translate. It was first launched in 2006 with «the goal to break language barriers and make the world more accessible» (Schuster, Johnson and Thorat 2016). In the beginning Google Translate was a statistical machine translation system. However, in 2016 Google launched a Multilingual Neural Machine Translation System with a method which enables zero-shot translation, making it possible for the system to translate between a high number of languages (Schuster, Johnson and Thorat 2016).

The newest addition, which is rapidly gaining in popularity, is DeepL. Its beginnings date back to the year 2007, when Gereon Frahling and Leo Fink started working on a search engine for translations, and, two years later, the first web search engine for translations (Linguee) was launched. Linguee allows people to see how others have translated certain phrases and is often used by students as well as professional translators. In 2014, Linguee developed machine learning tools that learn from translations. In 2016, the Linguee team started working on a neural network system – later known as DeepL (DeepL History).

2.2. *Machine translation in the industry*

Globalisation and digitalisation have led to an increasing demand in language services. According to the Annual Review of the Services and Technology Industry That Supports Translation, Localization, and Interpreting (2018) the global market for

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outsourced translation and interpreting services and technology will reach US$46.52 billion in 2018 and will increase to US$56.18 billion by 2021 (DePalma, Pielmeier and Stewart 2018; Press Release Newswire 2018).

Due to this increasing demand, many agencies and institutions, e.g. the European Union[1], are already using MT. So, in the future there will definitely be a higher demand of post-editors. However, there are limitations in the world of MT, because there will always be sensitive areas in which professional human translators are required[2]. The integrity of qualified human translators and interpreters is required in the area of law, medicine and migration – especially when it comes to intercultural communication (cf. also 2.3.2).

Although machine translation has made a lot of progress over the last years, BDÜ (2018) and Bernard (2018) underline that this is exactly the problem. Non-professional translators, who might understand both languages, do not recognise mistakes, because the translation sounds «good and correct» (BDÜ 2018). Bernard (2018) underlines that «it's the little things that cause big problems though»[3] (Bernard 2018). Bernard explains that DeepL is the new star of the MT industry, promising idiomatic translations that are easy to read – businesses requiring translations are excited and some translators are worried about their future. However, looking closer at the machine-translated text, it will reveal mistranslations – especially in technical texts (Bernard 2018).

With the improvement and development of neural machine translation (NMT) systems, the number of people using this fast and cheap option instead of contacting a professional translator could increase. However, clients often might not know what they are agreeing to in exchange for no-cost machine translation, especially when it comes to their own or their client's confidentiality, as translated texts are automatically integrated into the software's language corpora.

Due to the progress of MT technology, the question arises whether professional translators should adapt to this development or continue their work as usual. There are professional translators who are sceptical about MT. However, there are also many who use the newest developments to their advantage. Professional translators have been

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1. cf. eTranslation of the European Commission https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/eTranslation

2. The importance of this development and the challenges related to it have become one of the most debated topics amongst scholars as well as international associations for translators and interpreters. This has led to the organisation of specialised conferences and events on the topic: e.g. the international conference of the Federal German Association of Interpreters and Translators «Dolmetschen und Übersetzen 4.0 – Neue Wege im digitalen Zeitalter» (Interpreting and Translating 4.0 – New Paths in the Era of Digitalisation Translation Natalie Mair) or the conference «Translation Technology in Education – Facilitator or Risk?» at the University of Nottingham.

3. Translation Natalie Mair.

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working with CAT tools for many years; and increasingly more are now also integrating machine translation systems into their process of translation. According to Champollion, O'Hagan and Ashworth (Lagoudaki 2008), many translators prefer a rough draft as a basis, which they then use to produce their final translation. Yet it remains to be seen whether professional translators will be able to decide for themselves about the use of MT or whether this will be imposed by clients and agencies.

2.3. *Machine translation in translator education programmes: the case of Austria*

Machine translation is not only a major issue within the industry, but also in translator education. Many universities have been debating about how to deal with these new tools, and positions vary from absolute prohibition in education programmes to free use at the students' discretion. In this section, we are going to analyse the presence or absence in curricula of translator education institutions on the one hand and papers published recently by different authors that address the use of MT in the translation classroom on the other hand.

2.3.1. Curricula

For our analysis, we looked at the curricula of the three Austrian universities, Vienna, Graz and Innsbruck[4], which offer Translation Education Programmes.

None of the three above-mentioned undergraduate (BA) curricula[5] mentions MT explicitly, even though all three curricula refer to technological aspects of translation: in Vienna, one module makes reference to «translation-relevant language technologies»[6] (BA Curriculum Vienna 2016, 8); in Graz, one module comprises the «use of translation-relevant information and communication technologies» (BA Curriculum Graz 2017, 20); and the curriculum in Innsbruck (BA Curriculum Innsbruck 2016, 12) mentions the «use of professional up-to-date tools and translation technologies» in final stage translation courses. However, despite these references to technology, MT does not seem to be a major issue in undergraduate programmes.

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4. Due to space limitations we were unable to take into account other institutions, but it would certainly be interesting to carry out research on a European or global level.

5. The latest version of the curricula are: Vienna (2016), Graz (2017) and Innsbruck (2016).

6. All translations in this section were performed by AS.

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Regarding MA degree programmes, there is a more diverse[7] perspective. The curriculum in Vienna (MA Curriculum Vienna 2015, 7) mentions MT explicitly in the module «Specialised Translation and Language Industry», which comprises «technologies and tools for machine translation, computer-aided translation and localisation (including pre- and post-editing, multilingual corpus and content management, translation memories, terminology data bases, ontologies, management of terminology and language resources)». The curriculum in Innsbruck refers to «modern translation technologies» (MA Curriculum Innsbruck 2009, 1 and 6) in compulsory modules and offers an optional module named «Professional Profiles/Ethics/Areas» (MA Curriculum Innsbruck 2009, 14) that includes «technical writing» and «pre- and post-editing». The curriculum in Graz (MA Curriculum Graz 2017, 13) only makes reference to «computer-assisted translation».

2.3.2 Research regarding MT in translator education

Even though the role of NMT in Translator Education is being widely discussed at the moment, specific research is relatively scarce, which is no wonder if we take into account that the most influential programmes have only been released in the past two years. As exemplified in section 2.3.1, many universities offer courses on machine translation and/or translation technology in specific courses mostly in MA programmes, even though this is bound to change in the near future (cf. Mellinger 2017, 281).

Some authors who conduct research in the field believe, however, that technological tools should be integrated in practical translation courses and become an integral part of Translator Education as argued by Massey and Ehrensberger-Dow (2017):

> It is therefore clear that translator education institutes should continue to keep abreast of technological developments, giving students as much direct experience as possible with the tools, processes and practices with which they are likely to be confronted in their professional lives (2017, 307).

Mellinger (2017) advocates for «the inclusion of controlled authoring, terminology management, engine tuning, and post-editing in translation practice courses in conjunction with courses dedicated to translation technologies» and claims that particularly «language-specific translation courses provide a natural locus for inquiry

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7. We will consider only the programmes for Specialised Translation («Fachkommunikation»). In Vienna (2015) and Innsbruck (2009), there is a common curriculum for Translation and Interpreting with different itineraries; in Graz (2017), on the contrary, there are two different curricula for Translation and Interpreting.

and learning related to specific target language renditions resulting from machine translation». This could also help improve students' language proficiency.

All of the mentioned authors (cf. also Flanagan and Christensen 2014, 272) consider this to be necessary to enhance graduates' employability in a world in which NMT and artificial intelligent in general will play an important role:

> By integrating and embedding machine translation across the curriculum, trainers can model expert behaviour and encourage students to engage in best practices, which will position them well for current industry practices (Mellinger 2017, 284).

At the same time, scholars highlight the possible dangers of the use of MT translations in the classroom, such as dependence and routinisation according to Massey and Ehrensberger-Dow (2017, 308), and the added value of the work provided by humans:

> Training programmes should encourage and foster the development of the human dimensions of intuition, creativity, and ethical judgement in order to ensure that graduates can deliver high-quality human translation when needed (Massey and Ehrensberger-Dow 2017, 308).

Regarding empirical research in the classroom, we would like to mention Flanagan and Christensen (2014), who examined trainees' interpretations of post-editing guidelines provided by professional associations through tasks, reflective essays and interviews and conclude that students have difficulties understanding some of these guidelines. They therefore suggest tailoring post-editing guidelines to students' needs and consider that special attention should be paid to this area in translator education research (2014, 258): «One area requiring further investigation is the training of translators in PE, with particular focus on PE guidelines for training purposes.»

Moorkens (2018) conducted an evaluation exercise with second year undergraduate students with little or no MT experience and participants at a PhD summer school «to empower the students, and help them understand the strengths and weaknesses of this new technology« (2018, 375). In this study, students had to compare the output of neural and statistical MT. The most important results include that an overwhelming majority showed a preference for NMT and that most students showed a positive attitude and interest in MT.

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3. THE STUDY

3.1. *Aim*

The aim of this research was to find out how BA and MA students approach a translation task when they are asked to use machine translation software, how they perform when they are required to proofread a machine translated text, and what their impression of machine translation software is.

3.2. *Educational context*

Two different translation classes participated in the study. The first translation class was an intermediate General Translation course in the BA programme. The second translation class was a Specialised Translation course in the MA programme.

3.3. *Material and approach*

The students were divided into two groups. The first group was asked to translate a text without using any machine translation assistance. The second group had to use DeepL and work with the machine translation.

The students did not receive any information about the history of MT or the machine translation software DeepL in the course of this study. The students working with DeepL were asked to copy the source text into DeepL and then post-edit the first version of the machine translation using the function «track changes».

Students who worked without DeepL will be referred to as group 1 and students who worked with DeepL will be referred to as group 2. In total, there were twenty participants[8] in the intermediate General Translation course (BA programme). Nine students translated the text without DeepL and eleven with DeepL. In the Specialised Translation course (MA programme), there were eleven participants[9] – six of them translated the text without DeepL and five students used DeepL.

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8. We received 20 translations and 19 questionnaires.
9. We received 11 translations and 9 questionnaires.

3.3.1. Questionnaire

The students also had to fill out a questionnaire. They were asked to write down how much time they needed for the translation including the post-editing of the DeepL version. There was one questionnaire for the students working without machine translation with three questions about the translation procedures, and one questionnaire for students working with machine translation with four additional questions about their impressions of working with MT.

The questions included in both questionnaires are as follows:

– Please describe how you approached the translations tasks (Key words: initial reading, textual analysis, consultation of sources, translation, revision etc.).
– Please write down which sources you used (parallel texts, dictionaries).
– Please indicate for which passages you used the individual sources.

The four additional questions for group 2 are the following:

– Please indicate if you used the programme's suggestions and where.
– Did you find it helpful to have a version to work with or would it have been easier to translate the text from scratch?
– Do you have the impression you saved time?
– Which advantages/disadvantages does the use of the software have, in your opinion, compared to translating the text yourself?

3.3.2. Translation tasks

In the BA course, the students had to translate a text from English into German. The source text consisted of 227 words. The title of the text was «7 Ways Inflammation Affects Your Body»[10]. The students were given one week to complete the translation task.

In the MA course, the students had to translate a technical text from English into German. The source text consisted of 271 words. The title of the text was «How IoT thermostats help companies and governments save money»[11]. The students were given one week to complete the translation task.

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10. https://www.health.com/pain/body-inflammation. Accessed December 12, 2018.
11. https://www.techrepublic.com/article/how-iot-thermostats-help-companies-and-governments-save-money/. Accessed December 12, 2018.

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After completing the translation task, the students handed in their translation in electronic form. For the analysis, we compared the DeepL version with the original and selected passages where the DeepL version showed flaws in order to observe how students in group 2 had dealt with these flaws, and if the results in group 1 were comparatively better.

3.4. *Results*

3.4.1. Comparison of the translations

The following categories were selected for this article: grammar, terminology, text conventions, and idiomatic expression. This categorisation is based on the error correcting system commonly used at our department.

Grammar

The headline *7 Ways Inflammation Affects Your Body* of the text used in the BA programme was rendered by the software very literally as *7 Arten Entzündung beeinflusst Ihren Körper*[12]. The software used a shortened relative clause that is typical of the English language but inexistent in German. No student in group 2 was satisfied with the software's version and all of them changed it to, in most cases, a correct German sentence. If we compare the versions with those of group 1, we cannot see any differences. In both groups we can find up to four different verbs (*auswirken*, *wirken*, *schaden*, *beeinträchtigen*, *beeinflussen*) and different syntactical options.

The section *we expect technology to be smart* of the source text the MA students received was also translated very literally by the software as *wir erwarten Technologie, um intelligent zu sein*. This suggestion is a syntactic calque, shown in the incorrect German infinitive structure *um…zu*, and is hardly comprehensible in German. All the students of group 2 recognised this mistranslation and changed it. If we compare the final versions of group 2 with those of group 1, we can see similar structures. In group 2, all the students used the verb *erwarten* suggested by DeepL. In group 1, five out of six students used the verb *erwarten*. No student, neither in group 1 nor in group 2, used the incorrect German infinitive structure.

12.   The text was translated by DeepL in May 2018. The result may vary and probably improve over time as the software seems to be able to «learn» from translated texts. The same applies to the other text quoted below.

The next example, again from the BA class, illustrates how students dealt with a participle placed after the noun. In German this structure is very rare and is usually translated as a relative clause, a prepositional phrase or a participle construction depending on the context. This structure is usually addressed in grammar and/ or translation class, so it should be familiar to students. The original sentence *You may even be well-informed about health conditions linked to inflammation* was translated by the software as *Möglicherweise sind Sie sogar gut informiert über die Erkrankungen im Zusammenhang mit Entzündungen*. In this context, the suggested prepositional phrase is opaque and does not convey the message adequately; also the sentence's grammaticality is, at least, questionable. In group 2, eight out of eleven students changed DeepL's suggestion to a syntactically correct solution (even though some versions contain a lexical mistake not directly linked to the software) varying between relative clauses (four students), other subordinate clauses (three students) and a participle construction (one student). In group 1, just one student offered an unacceptable version similar to the software's. The other students chose acceptable solutions, such as relative clauses (four students), a different subordinate clause (one), a nominal phrase (one), a participle construction (one) or a prepositional phrase (one).

Terminology

In the source text of the BA group, *stress, infection, or toxins* are called *invaders*. The literal translation into German would be *Eindringlinge*; however, this term is unsuitable for at least one element of the list, which is why an alternative such as *Bedrohungen* or *Risiken* would be more appropriate. In group 2, nine out of eleven students did not change the software's suggestion of *invaders*, while two found a more appropriate solution. On the other hand, all students in group 1 chose the unsuitable term *Eindringlinge*.

In the source text given to the MA group, *not accessible* is used to describe the smart devices and analytics in old buildings. The software suggested the – in this context unsuitable – translation *nicht zugänglich.* In group 2, three out of five changed the suggested translation. Two of them chose a more acceptable option, namely *nicht vorhanden/verfügbar*. One chose an unsuitable synonym. In group 1, two students chose the same unsuitable option as the software; three used an inappropriate synonym, and one found an acceptable solution.

In the source text translated by the MA students, the abbreviation for *wireless pneumatic thermostats – WPT –* is used in brackets before being used without an explanation in the rest of the text. The translation suggested by the software was *drahtlose pneumatische Thermostate (WPT).* In group 2, two out of five students adopted the software's version. One student explained that the abbreviation was

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from the English language and two students decided to leave out the abbreviation. In group 1, four out of six students explained that the abbreviation *WPT* stood for the English term *wireless pneumatic thermostats*. One student from group 1 interpreted this in the wrong way and thought the abbreviation *WPT* referred to a thermostat type. One student only used the German translation and did not use an abbreviation in the translation.

Text conventions

At the end of the text used in the BA class, readers are invited to watch a video: *Watch this video to learn more.…* According to German textual conventions it would be advisable to avoid the direct imperative style and find a less direct, content-centered expression: *In diesem Video erfahren Sie.…* The version provided by DeepL contains the imperative, even though the sentence is grammatically impeccable. In group 2, ten out of eleven students kept the imperative (nine made no changes at all) and only one adapted the text to German textual conventions. In group 1, seven out of nine used the imperative, even though two started the sentence with a subordinate clause. Two students translated the sentence according to the aforementioned German text conventions. Overall, the translations in group 1 are more varied, as expected.

At the beginning of the text used in the MA course, the following structure is used in English: *…how installing wireless thermostats can transform building power systems*. The software's translation was *…wie die Installation von drahtlosen pneumatischen Thermostaten die Energieversorgung umstellen kann*. The participle structure (*installing*) was changed to the nominal structure (*die Installation*) – typical for the German language. However, the system did not suggest the best solution, as it used personalisation. In group 2, all students adopted the nominal structure suggested by the software, additionally, four out of five avoided personalisation by using the preposition *durch* (e.g*. durch die Installation)*. In group 1, all students used a nominal structure in their translation, but only three out of six avoided personalisation.

Idiomatic expression

We analysed various passages to evaluate the target text's naturalness and we could find no considerable differences between the two groups. We are going to show three examples which represent our findings.

In the case of the expression *for starters* (*For starters, inflammation is your body's natural defense…*) in the BA course, translated by DeepL inappropriately as *für den Anfang*, only two students in group 2 accepted this suggestion, while the other nine

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changed it (seven provided an acceptable, two an idiomatically unacceptable, but still comprehensible solution). In group 1, four students provided an acceptable solution, two an idiomatically unacceptable, but still comprehensible version and three seem not to have understood the expression at all. It seems that DeepL at least helped students understand the expression even though not all provided a natural version in the target language.

The next example from the BA course shows a slightly better result in group 1. The selected sentence *In some cases, the body can go overboard with inflammation, often referred to as chronic inflammation* was translated by DeepL as *In manchen Fällen kann der Körper mit einer Entzündung über Board gehen*. Only one student in group 2 kept this incomprehensible version. Among the other ten different versions we found two translations that did not render the message correctly, while the other eight students chose a variety of suitable verbs (*zu weit gehen, übertreiben, überfordern, hinausschießen, überschreiten*). In group 1, there was only one wrong translation. However, among the acceptable solutions six out of eight students chose the same verb (*übertreiben*). Although group 2 worked with a given translation, the lexical variety was surprisingly broader than expected, whereas the students from group 1 did not use a great range of different verbs.

Our next example can be classified as one of «the little things that cause problems» as Bernard (2018) expresses it (cf. 2.2). The following sentence appears just after the sentence quoted in the previous paragraph: *When this happens, it puts you at risk of a number of health problems…*. It was translated by the software as *Wenn dies geschieht, bringt es Sie in Gefahr, eine Reihe von gesundheitlichen Problemen…*. At a first glance, this might seem correct, however, it is not clear what this undefined *es* in the German translation refers to. In group 2, one post-edited translation is incomprehensible. Another student did not change the software's unidiomatic translation. The other nine students offered seven different suitable solutions. In group 1, the content of the text was changed through the translation by two students. One version was unidiomatic but still comprehensible, and in another translation the grammatical structure was unacceptable. The five remaining versions just showed three different acceptable expressions, namely *steigt das Riskiko, steight die Gefahr, besteht das Risiko*. Again, this example shows that the students working with the given translation by DeepL used a broader range of lexical options.

3.4.2. Questionnaires

The questionnaires comprised items regarding translation procedure and use of sources for all participants and specific questions concerning the usefulness of the programme for those students who had worked with it.

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Regarding translation procedures and use of sources, we could not detect any significant differences between the two groups, but rather individual differences. Some students consulted up to seven dictionaries or eight parallel texts while others used hardly any. Most students who had used DeepL did not consult the programme's alternative suggestions, while others used them in one to seven cases.

The questions regarding the usefulness of the programme rendered more interesting results:

In total, 14 out of 28 students (10 in General and 4 in Specialised Translation)[13] worked with DeepL.

As answer to the question «Did you find it helpful to have a version to work with or would it have been easier to translate text from scratch?», 79 % declared the software to be useful (70 % in Gen. T and 100 % in Spec.T).

For the following question, «Do you have the impression you saved time?», 64 % (70 % in Gen. T and 50 % in Spec. T) answered in the affirmative. The difference in Specialised Translation was probably due to the fact, as can be deduced from the comments, that students checked specialised terminology.

We also asked students how long it had taken them to complete the task, and, although individual translation speed varies considerably among students, the results confirm that the programme helped them save time: In General Translation the students working with DeepL took 55 minutes to complete the task on average, the others 92 minutes. In Specialised Translation, students working with the software needed 67 minutes on average, the others 91.

Our final question addressed the advantages and disadvantages compared with human translations. We obtained answers relative to the quality of the final product as well as the translation process.

Product-related advantages that were mentioned refer to correct grammar (1 mention), the naturalness of the translation (1) and the software's usefulness for general texts (1). Regarding the process, many students mentioned the time-saving aspect (10) and the possibility to work on a given basis and with suggestions (6). One found the process easier (1) and another said they had less fear of inadvertently leaving out a sentence (1).

Neutral comments on the process included a mention about the process being totally different (1), the need of a critical attitude (1) and of a good revision of the first version (1).

Product-related disadvantages refer to the lack of sense (2), lack of naturalness (1), lack of accuracy regarding syntax and grammar (1) and worse quality in general (1). Process-related disadvantages mentioned are that translators don't familiarise themselves with the text (1), that it can be time-consuming (1) and laborious (1), that

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13.   3 students provided no questionnaire.

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it has to be compared with the source text (1), that it is unsuitable for specialised translation as the translator has to research the terminology anyway (1), the difficulty to detect errors (1) an overreliance on the programme regarding wording and terminology (2) and a reluctance to make changes to obtain a better product (2). In general, many students seem to be dissatisfied with the result as the following quote shows: «The result does not satisfy me. If I had to put my name to the translation, I would rather translate the whole text myself»[14].

4. CONCLUSIONS

Although the results of the questionnaires show that most students using the software saved time, it also became clear that the amount of time each student needed highly depends on the text type and the individual student translator. Teachers and students might think that translations will be worse if they use MT. Students in general appreciate the time-saving aspects but have doubts regarding the quality of the software's translation.

However, the results of the comparison of the groups do not render any considerable differences. Most students in group 2 were willing to change the software's suggested version. Only one example showed clearly that group 1 worked in a more reflective way by explaining the abbreviation WPT, while no student from group 2 explained the abbreviation, and the majority of them adopted the software's incomplete version.

In Specialised Translation, there were many students whose mother-tongue was not German. Therefore, the final translation (group 1 and 2) often lacked idiomatic expressions. Students using DeepL (group 2) made fewer grammatical mistakes and seemed to understand the source text better, however, this did not lead to an overall satisfying translation.

Even though the results did not confirm our worst fears and are rather encouraging regarding out students' willingness to provide a good translation, we still face the challenge of dealing with a development that will have a major impact on translator education.

As a consequence of the new technological developments in MT, translators of the future need to develop two different though obviously interrelated skill sets: on the one hand, they need to develop translation competence in the traditional sense (PACTE 2001 and EMT Expert Group 2009) and, on the other hand, they need to develop skills to pre-edit, post-edit and proofread machine translated texts. We expect linguistic competence in the target language, cultural competence in both languages and an

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14.   Translation by AS.

exhaustive textual analysis to play an even more important role in future translator education.

Despite the small sample, we consider this research to be a valuable start in the empirical classroom research in the area of using MT in translator education. It has led to more questions regarding challenges, limitations and possibilities of using MT in the classroom. These questions will have to be answered in the near future.

It will certainly be our role as professional translator trainers to develop strategies and activities to enable students to judge the usefulness of this software adequately (cf. also Moorkens 2018, 375 and Massey and Ehrensberger-Dow 2017, 307) and to use it as a tool that can help them translate better and more efficiently in many, even though not in all, situations.

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