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Sustainability and Influence of Machine Translation: Perceptions and Attitudes of Translation Instructors and Learners in Hong Kong

Kanglong Liu [1,*] **, Ho Ling Kwok** [1] **, Jianwen Liu** [2] **and Andrew K.F. Cheung** [1,*]

[1] Department of Chinese and Bilingual Studies, The Hong Kong Polytechnic University, Hong Kong, China; hl-bonnie.kwok@polyu.edu.hk
[2] Department of English Language and Literature, Hong Kong Shue Yan University, Hong Kong, China; jwliu@hksyu.edu
* Correspondence: klliu@polyu.edu.hk (K.L.); andrew.cheung@polyu.edu.hk (A.K.F.C.);
Tel.: +852-27667451 (K.L.); +852-27667448 (A.K.F.C.)

Abstract: In this era of globalisation, translation technologies have become more popular in daily communication, the education sector, and the translation industry. It is observed that there is a prevalent use of machine translation (MT) among translation learners. The proper use versus abuse of MT can be a critical issue regarding its role in and impact on translation teaching. This exploratory study aims at investigating learners' and instructors' knowledge of MT, experience in MT use, perceived MT quality, ethics of MT use, and the perceived relationship between MT and translation training, in order to figure out the usefulness of MT in translation competence acquisition and the necessity of MT training. To this end, we conducted surveys and semi-structured interviews and found that the influence of MT in translation competence acquisition is determined by the properties of MT and learners' quality. MT is particularly helpful in gaining lexical knowledge and knowledge to ensure translation efficiency, but not in bicultural knowledge. However, such usefulness builds on learners' language proficiency, analytic ability, and learning motivation. In light of the findings, issues including the sustainability of MT from ethical and linguistic perspectives, and the potential and proper use of MT to inform translator training, are discussed.

Keywords: machine translation; translation competence; translation competence acquisition

1. Introduction

1.1. Translation and Technology

In this era of scientific and technological innovation, language and translation technologies have become more mature with the advancement of artificial intelligence. Users can obtain translations and overcome language barriers easily and quickly at no cost using free online translation tools, such as Google Translate and DeepL, for daily communication purposes [1,2]. In the translation industry, technology has shown increasing importance [3]. Doherty et al. reported growing requests from clients for machine translation (MT) use in translation projects [4]. Against such a background, more voices suggest that translation students and graduates need to familiarise themselves with Computer-Assisted Translation (CAT) and translation technologies, such as MT and translation memories, to ensure professional robustness and sustainability in the industry [5–9]. Under this claim, it is inevitable that training in translation technologies has become necessary in order to fulfil the need of the translation market.

However, there are opposing views to the use of MT based on issues of thoroughness, accuracy, and human redundancy. Despite the value and prevalence of MT in the translation market, it would be naïve to think that MT can be relied on without some level of post-editing with regard to both contextual and colloquial appropriateness as well as lingering

lexical and grammatical errors [10]. In fact, Lafeber's study indicates that familiarity with MT is not an essential skill for translators to work at inter-governmental organisations [11].

Owing to the controversial discussion on the necessity of training in translation technologies, language and translation instructors are concerned that improper use of the tools may negatively impact language learning or even the overall academic experience [12]. Although MT and CAT tools have improved in recent years, their quality is still questioned by some educators and professional translators. Furthermore, the use of MT-translated texts can also bring forth various ethical issues. As learners are still at the stage of acquiring translation competence, placing heavy reliance on these tools may impede learners' development as independent and competent translators.

Sustainability is usually regarded as the capability to continue and sustain in the long term. The sustainability issue in the field of translation has been discussed mainly in two strands. Some scholars have examined the sustainability of translation industry and translation profession as a result of technological development [13], whereas some have examined translation as a profession that can make an impact on ecological and environmental systems in the long run [14]. In the context of using machine translation in translation teaching, research mainly follows the first strand, in which sustainability denotes to what extent potential MT use can impact on the sustainability of the translation ecosystem including the translation profession (thus translator education). Such an issue can also be approached by examining the dialectical relation between MT and human translation [15]. In this line of research, much discussion centres on how MT can be employed to aid translation practice but little is known about its potential impact on the translator education field. To the best of our knowledge, no research has attempted to investigate the influence of MT on students' translation competence acquisition by examining the viewpoints and perceptions of translation instructors and students. To fill such a gap, this study aims to systematically examine the role and position of MT in translator training programmes.

1.2. What Is Machine Translation (MT)?

Machine translation (MT) is often defined as translating a text from one natural language into another by a computerised system without human involvement [16]. Most MT technologies support the instant translations of sentences, paragraphs, document files, and even a whole website. The power of MT is not limited to text-to-text translations. They can also work on speech translations. It is estimated that more than 1000 types of online and offline translation software are available in the global market [17]. Many of them can be used for free.

The mechanisms used in MT for automatic translation can be roughly categorised into rule-based and statistical approaches. Rule-based MT is pre-programmed using dictionaries and linguistic rules (including rules of morphology, syntax, and semantics). The translation is performed based on these rules. Statistical MT (SMT) works with machine learning from large sets of parallel texts translated by humans. The available amount of parallel data determines the quality of MT output [18]. Various translation software packages and platforms, including Google Translate and SYSTRAN, used SMT before switching to neural MT (NMT). Some MT engines adopt a hybrid approach to take advantages of both rule-based MT and SMT, such as SYSTRAN [19]. Recently, NMT has emerged. Compared with SMT, which translates source texts on a lexical or phrasal basis, the translation unit of the NMT system is extended to sentence-based units. The entire sentence context helps produce more relevant and natural translations [20,21]. Techniques used by NMT can greatly improve the output quality [22,23]. DeepL Translator is based on artificial neural networks to perform the translations [24]. Starting from 2016, Google Translate has applied NMT to the translation of eight popular language pairs [20].

As MT tools are easily accessible and free of charge, the prevalence and popularity of MT is not a surprise. Among many MT tools, Google Translate is the most popular and commonly used by MT users for different purposes [2]. It is also consistently found

that most students are familiar with and favour Google Translate [16] and even use it for language learning [25,26]. Some findings suggested that users perceived Google Translate as a more useful, satisfactory, and quality tool than other MT systems [27–29]. However, students were also found to rely on MT tools even though they were aware of their inadequacies and unreliability [9]. The proper use versus abuse of MT has become a critical issue regarding its role in both translation profession and translator education. In the following, we will discuss two main concerns about MT examined in the previous research: quality and ethical issues.

1.3. Quality of MT

According to a survey conducted with employers of translation companies, the ability to produce quality translations is considered the most essential and important competence of translators apart from identifying client requirements and an awareness of professional ethics and standards [30]. Quality is always the primary concern in the field of the translation industry. Quality assessment includes language simplicity [31], source-text-oriented accuracy, target-text-oriented fluency, readability, comprehensibility, usability, and acceptability [32]. In the evolution history of MT mechanisms and techniques, engineers are also keen on pursuing more accurate and natural translation outputs. Though improvements have been made, NMT output still contains omissions, additions, and mistranslations [33]. Thus, post-editing of machine-generated translation outputs is still inevitable for ensuring accurate translations between two languages [3,10,31].

Although MT tools offer users a fast and convenient choice to access information and communicate with others in different languages, users do not always trust their translation outputs. Gaspari et al. [3] gathered responses from stakeholders in the translation field, including translators, translation providers, learners, instructors, researchers, and service users. The majority reflected that MT tools were not customised to fit their needs. Half of the participants were dissatisfied with the quality, and some even commented that the accessible MT tools had low or poor quality. Comments such as "low accuracy" and "not very reliable" were also made by translation students [9]. Previous research has also identified a direct correlation between the education level of end-users and dissatisfaction with MT quality [2]. In contrast, MT users with lower second-language proficiency tended to show more satisfaction and trust in MT [34].

One of the major issues regarding the low quality of MT output is associated with insufficient support mechanisms in cross-cultural communication [35]. As different languages have their own culture-specific linguistic items and expressions which have a close connection with context, MT is still struggling to solve such issues without human intervention. Another issue is about MT translations in high-risk conditions, where meanings are highly crucial, such as corresponding in crisis situations. Errors of MT output can result in reputational and professional costs for MT users [1]. A previous study has found that the comprehensibility of a translation is closely associated with greater trust in crisis communications [34]. It is also found that non-specialist MT users have a stronger reaction to fluency errors than to content errors [36]. This shows that misuse of MT might give rise to the risk of misinformation and miscommunication.

Garcia proposed that MT tools are intended for an "educated bilingual" instead of a "professional translator" [37]. As translation learners are situated in between these two statuses, their knowledge of the pros and cons of MT can determine whether they can use MT properly in the translation learning stage and their future translation career.

1.4. Ethics of MT Use

The use of MT output texts in academic settings can be an issue of ethics in terms of the potential for academic plagiarism, which has led to substantial discussions regarding its role and application. From the perspective of students, whether the use of MT will lead to academic misconduct and plagiarism are to a large extent subject to the assignment type. It is generally agreed that students should not use MT for exams or graded work [16],

especially when the assignments involve translation tasks [16,38]. The translation length also matters. When the translation task has a long length, more respondents regarded the use of MT as "unethical" or "completely unethical" [38]. Instructors demonstrated similar viewpoints on the ethics of MT use, but they held a stricter standard than students [38]. The ethical evaluation of MT use reflects the fairness perceived by students in terms of how they value their own efforts as human translators. It can be safely postulated that their awareness of ethics determines how they use or abuse the MT technology, which can affect their growth as professional translators.

1.5. Translation Competence Model and Translation Competence Acquisition Model

In view of the prevalent use of MT in students' daily school experiences, MT has certainly played a role in the development and acquisition of students' translation competence. Thus, the role of MT in translator education can be explored using the framework of translation competence. In this line of research, PACTE, a group of researchers who have conducted various empirical studies to study the components and acquisition of translation competence, has done some seminal work to explore what constitutes and characterises translation competence [39–42]. According to PACTE [41], translation competence refers to the underlying system of the expert knowledge that a competent professional translator should possess. Five sub-competencies, namely, bilingual sub-competence, extralinguistic sub-competence, instrumental sub-competence, knowledge about translation sub-competence, and strategic sub-competence, are integrated. Besides, psycho-physiological components are activated in each translation activity. These sub-competences constitute the translation competence model [41].

The various sub-competences can be approached from the concept of expert knowledge, which consists of both declarative and procedural knowledge [43]. Declarative knowledge represents "knowing what", which is learnt through exposure to information, both extrinsic and translational. For example, extra-linguistic sub-competence and knowledge about translation sub-competence are related to declarative knowledge, whereas bilingual, instrumental, and strategic sub-competences are related to procedural knowledge [41], which represents "knowing how" and is learnt through repeated practice to achieve automation. Unlike the five sub-competencies, psycho-physiological components function to integrate all sub-competences. These are made up of attitudinal, cognitive, and psycho-motor aspects impingent on the act of translation, such as confidence, motivation, analysis, and reasoning [41].

It should be pointed out that MT was at its infancy when this translation competence model was developed. However, MT use is closely related to some of the sub-competences of the translation competence model. For example, students might use MT to improve their bilingual sub-competence, which comprises lexical, grammatical, and textual knowledge between two languages. Besides, MT as a popular translation tool is naturally related to instrumental sub-competence, which aims at applying different resources to help one's translation quality. In this regard, we believe that MT use in translation teaching settings can be explored using the translation competence model.

1.6. Research Questions

Based on the foregoing review, we can see that previous survey-based studies on MT mainly focused on investigating its perceived output quality and reliability [2,3,9,38], purpose of use [2,4,38], ethical issue underlying MT use [4,38], quality assessment techniques and scenarios of post-editing [3], its penetration rate in various industries [4], the popularity ranking of MT types [4,9], and overall perceptions and beliefs about MT from the perspectives of students and teachers in foreign-language teaching settings [38]. To the best of our knowledge, little research effort has been made to investigate the use and usefulness of MT in translator training settings from the perspectives of translation students and instructors.

As suggested by Rossi and Chevrot, perceptions of MT can affect users' actual use and perceived usefulness of MT [44]. In this exploratory study, we followed previous

investigations to explore the use patterns of MT by students and instructors, their attitudes towards MT output quality, and ethical evaluations of MT use. As a survey conducted in translation teaching settings, we further examined the self-assessed knowledge of MT by instructors and learners, the perceived influence and usefulness of MT on translation competence acquisition, and the perceived necessity to incorporating MT into the translation curriculum. These aspects are worthy of investigation as they are directly related to the role of MT in training for future translators and the sustainability of MT as a whole. In this survey study, we mainly address the following two research questions:

RQ1: How do translation learners and instructors perceive the usefulness and influence of MT on translation competence acquisition?

RQ2: How do translation learners and instructors perceive the necessity of incorporating MT training into the translation curriculum?

The findings are expected to inform translation teaching regarding the proper use of MT in teaching settings and maximising the potential of MT to enhance the development of students' translation competence.

As Hong Kong is a bilingual city with a colonial past where both Chinese and English are official languages, translation between Chinese and English languages is common and in high demand in this city. Almost all the key universities in Hong Kong have offered translation degree programmes or translation-related courses between English and Chinese. In view of this, the current study narrowed the research scope to Chinese–English and English–Chinese translations.

2. Materials and Methods

2.1. Design

This is a small-scale study adopting a mixed-methods design to provide an initial picture of the perceived influence of MT on translation competence acquisition and compare between translation instructors' and learners' use and perceptions of MT in Hong Kong. The survey provided general patterns, while semi-structured, in-depth interviews were considered a supplement to the survey results by collecting additional qualitative information, such as in-depth experience sharing and personal insights into the emergent patterns.

2.2. Participants

A total of 21 undergraduate (UG) and 39 postgraduate (PG) students majoring in translation in Hong Kong universities were recruited as participants in the survey (see Table 1). All of them reported themselves to be proficient in Chinese and English. For the UG group, they were aged 19 to 28 (M = 21.3, SD = 1.9). Among these participants, 18 (85.7%) were female. A total of 18 (85.7%) participants reported Chinese (Cantonese) as their native language, while 6 (28.6%) participants reported Chinese (Mandarin) as their native language. For the PG group, they were aged 21 to 27 (M = 23.6, SD = 1.5). Among these participants, 32 (82.1%) of these were female. A total of 8 (20.5%) participants reported Chinese (Cantonese) as their native language, while 36 (92.3%) participants reported Chinese (Mandarin) as their native language. All participants took part in the survey on a voluntary basis.

Participants in this survey study were invited to participate in the follow-up interview. Four students were recruited as participants in the in-depth interview, two from an UG programme and two from a PG programme. They were all female between the ages of 21 and 25.

A total of 15 academic staff from various universities in Hong Kong who had taught translation-related courses were also recruited as participants in the survey study (see Table 2). Among them, 8 (53.3%) were female. Their average teaching experience in tertiary institutions was 13.9 years (SD = 6.3). All the staff participants reported themselves to be proficient in Chinese and English. A total of 5 (33.3%) participants reported Chinese (Cantonese) as their native language, while 11 (73.3%) participants reported Chinese (Mandarin) as their native language. All participants took part in this survey on a voluntary basis.

Table 1. Demographic information of the learner groups.

	Undergraduate (UG) (N = 21)	Postgraduate (PG) (N = 39)
Age (years)	21.3 (*SD* = 1.9)	23.6 (*SD* = 1.5)
Gender		
Female	18 (85.7%)	32 (82.1%)
Male	3 (14.3%)	7 (17.9%)
Native language (multiple selections)		
Chinese (Cantonese)	18 (85.7%)	8 (20.5%)
Chinese (Mandarin)	6 (28.6%)	36 (92.3%)
English	0 (0%)	1 (2.6%)

Table 2. Demographic information of the instructor group.

	Survey (N = 15)
Gender	
Female	8 (53.3%)
Male	7 (46.7%)
Teaching experience (years)	13.9 (*SD* = 6.3)
Native language (multiple selections)	
Chinese (Cantonese)	5 (33.3%)
Chinese (Mandarin)	11 (73.3%)
English	0 (0%)

Similar to the interview setup with the learner group, instructors who completed the survey were also invited to participate in a follow-up interview. Two academic staff were recruited as participants in the in-depth interview. They were female with more than ten years of tertiary translation teaching experience.

2.3. Instruments

2.3.1. Survey

The questionnaires for both learners and instructors were constructed by reviewing previous literature, including the translation competence model and translation competence acquisition model [41], and previous studies related to the use and perceptions of machine translation from the perspectives of instructors [38], students [9,38], and end-users [2].

The learner questionnaire (see Appendix A) is comprised of sixteen questions, covering six aspects: (1) demographic information (native language, gender, age, education level); (2) knowledge about MT; (3) experience of using MT; (4) perceived quality of MT; (5) ethical evaluations; (6) MT and translation training.

The instructor questionnaire (see Appendix B) is comprised of fourteen questions in six areas: (1) demographic information (native language, gender, age, teaching experience in translation); (2) knowledge about MT; (3) experience of using MT; (4) perceived quality of MT; (5) ethical evaluations; (6) MT and translation training.

Most of the learners' and instructors' survey questions were close-ended, with only a few open-ended questions. The questionnaires were conducted online.

2.3.2. Interview Protocol

The protocols for both learner and instructor interviews were developed to collect comparable qualitative data. The structures were very similar to those in the surveys. However, open-ended questions asking "how" and "why" were the primary question forms this time. Apart from the questions pre-designed in the protocol, follow-up questions were allowed, depending on the interviewees' responses.

2.4. Procedures

An invitation was sent to academic staff who taught translation courses at universities in Hong Kong. They were invited to complete an online survey as translation instructors and help deliver the student survey to their students.

The survey data were collected using Tencent Survey. Potential participants were informed of the research purpose. They also needed to indicate that they could fulfil all inclusion criteria and consent to participation before the survey started. The duration of time to complete the questionnaire was approximately 15 min.

The survey participants interested in the interview left their email addresses with the research team. We then contacted and obtained consent from them individually. The interviews were conducted online using the language that both interviewer and interviewee felt comfortable with, i.e., Cantonese or Mandarin. The conversations were recorded for analysis. The duration of time to complete an interview was approximately 30 to 45 min.

2.5. Data Analysis

Descriptive statistics of the survey data collected from the UG students, PG students, and instructors were calculated separately. The in-depth interview data were transcribed and were treated as complementary information to the survey results.

3. Results

3.1. Knowledge about MT

Before probing into participants' perceptions of and attitudes towards MT, it was crucial to figure out how much they knew about MT (Figure 1). A high majority of UG (76.2%), PG (74.3%), and instructors (80.0%) *strongly agreed* or *agreed* that they knew *the definition and examples of MT*. Interestingly, a high percentage of UG respondents (76.2%) reported their *proficient use of MT*, but only 38.1% understood the *mechanism that makes MT work*. In contrast, 64.1% and 51.3% of PG respondents reported *understanding of MT mechanism* and *proficient use of it*, respectively. For instructors, 53.4% claimed that they understood the MT mechanism and 60% could use MT proficiently.
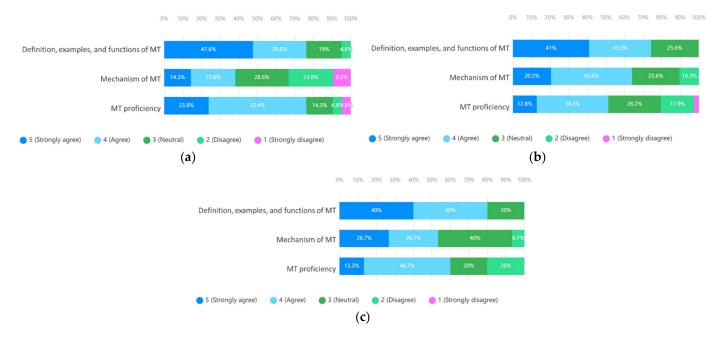

Figure 1. Knowledge about MT: (**a**) undergraduate students; (**b**) postgraduate students; (**c**) instructors. (No instructors chose the "Strongly disagree" option).

3.2. Experience in Using MT

All learners used MT to complete translation assignments (Figure 2). Over 60% of the UG and PG students stated they *always* or *frequently* used MT for their assignments. The interviews also revealed a prevalent use of MT in translation learning. *Interviewee 2 (PG, aged 22)* believed that "MT should be a must for every translator". This echoed the view of *Interviewee 3 (UG, aged 21)* that "we can use it and we should use it" because MT increased efficiency. Compared with the learner groups, a smaller portion of instructors (33.4%) *always* or *frequently* used MT in the process of translation. *Interviewee 5* (*instructor*) shared that the workload for editing a machine-translated text was heavier than producing a complete translation on her own, so she used MT mainly for looking up other possible translation expressions.
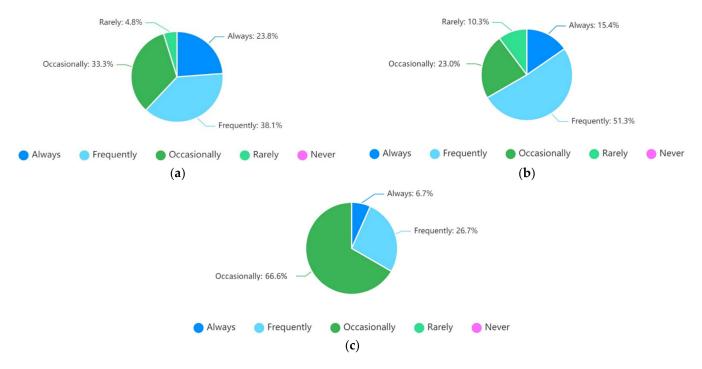

Figure 2. Frequency of using MT: (**a**) undergraduate students; (**b**) postgraduate students; (**c**) instructors. (No participants chose the "Never" option).

Figure 3 presents a quantitative analysis of the reasons why learners and instructors used MT during translation. *Convenience* (UG: 90.5%; PG: 74.4%; instructors: 73.3%) and *improving translation efficiency* (UG: 85.7%; PG: 66.7%; instructors: 53.3%) were the top two reasons in both learner and instructor groups. Speaking of the ease of access to MT nowadays, *Interviewee 1* (*PG, aged 25*) and *2* (*PG, aged 22*) mentioned that they had installed MT software on their computers. *Interviewee 2* (*PG, aged 22*) mentioned that "the machine translation software is automatically activated when I log on to the computer and is always available". Although *satisfactory output quality* (UG: 23.8%; PG: 33.3%; instructors: 0%) was not the main reason to use MT, some respondents did consider the quality when they chose their primary MT tool. *Interviewee 1* (*PG, aged 25*) and *4* (*UG, aged 21*) would compare the output quality of different MT tools and select those with higher accuracy. *Interviewee 5* (*instructor*) elaborated that if the output version given by an MT platform was the same as her own translation or deemed of a lower quality, she would try another MT platform.
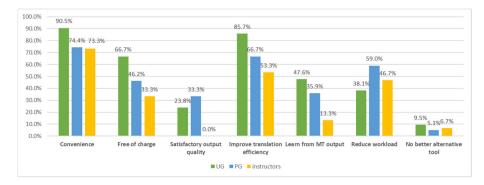
Figure 3. Reason(s) for MT use.

In terms of the frequency of MT use for different purposes (Figure 4), a high percentage of participants among both the UG (71.4%) and PG (82.0%) groups reported they *always* or *frequently* used MT for *checking meanings of certain words or phrases*. *Verifying own translations* was another relatively common purpose in both groups (UG: 80.9%; PG: 64.1%). More than a quarter of respondents reported that MT was *rarely* or even *never* employed to *produce translated texts for direct use or post-editing* (UG: 42.8%; PG: 28.2%).
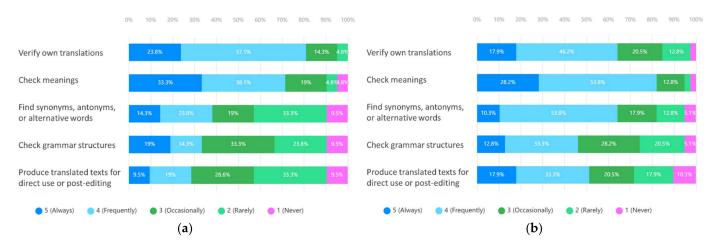

Figure 4. Purposes of MT use in completing translation assignments: (**a**) undergraduate students; (**b**) postgraduate students.

Both UG and PG groups showed a similar pattern of handling the raw machine-translated texts (Figure 5). The majority preferred *translating the texts by themselves with the assistance of MT*. Importantly, 90.5% of UG and 79.5% of PG respondents *always* or *frequently* adopted this approach. Moreover, 42.9% of UG and 46.2% of PG respondents had *never used the raw machine-translated texts without modifications*. These results confirmed the above findings that most learners regarded MT as a dictionary or a supporting tool for verifying their own translations.

3.3. Quality of MT

With respect to the learners' evaluations of MT quality, the majority of UG and PG respondents rated MT output as *very accurate* or *accurate* when the source input was a *sentence* or *individual words*, respectively. By contrast, translation unit length is perceived as an important factor of translation quality in the instructors' data. Specifically, when the translation unit is of a longer length, fewer respondents would consider its MT output as *very accurate* or *accurate*. Overall, the percentages of respondents who agreed that MT translated *entire texts very accurately* or *accurately* are the lowest (UG: 14.3%; PG: 28.2%; instructors: 6.7%) (Figure 6).
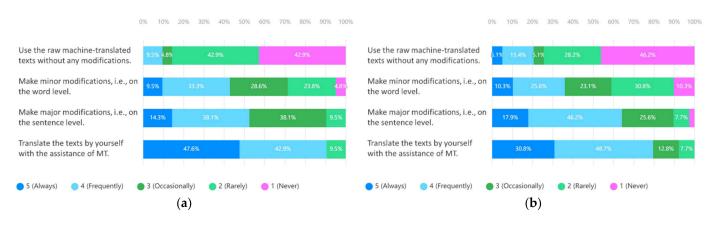
Figure 5. Ways of handling the raw machine-translated texts: (**a**) undergraduate students; (**b**) postgraduate students.
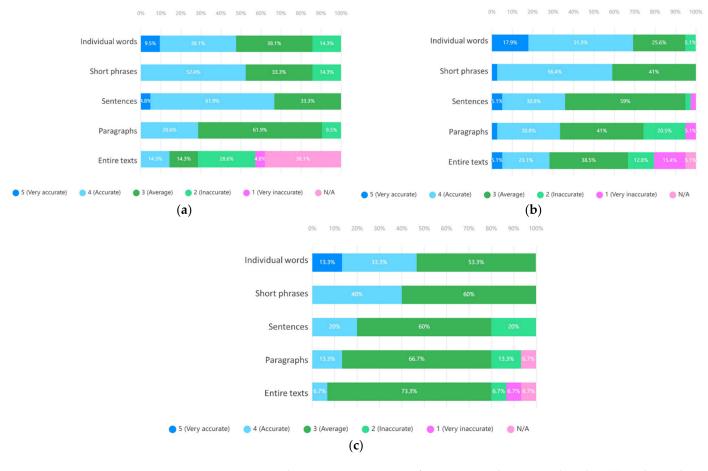

Figure 6. Perceived MT output accuracy of various translation unit lengths: (**a**) undergraduate students; (**b**) postgraduate students; (**c**) instructors. (N/A: participants did not use, or seldom used MT to translate such translation units, and hence they were unable to judge the translation output accuracy).

Interviewee 5 (*instructor*) stated that MT quality was steadily improving, and the quality of some MT platforms was quite stable. However, they were still not sophisticated enough in translating texts at the syntactic level, especially Chinese language, which has quite different syntactic rules to English.

Figure 7 indicates that a greater percentage of respondents judged *English-to-Chinese* translation (UG: 57.2%; PG: 35.9%; instructors: 40.0%) to be *very accurate* or *accurate*, which

is higher than for *Chinese-to-English* translation (UG: 47.7%; PG: 25.6%; instructors: 6.7%). *Interviewee 5* (*instructor*) also agreed that English-to-Chinese translation was generally more precise. Specifically, Baidu Translate (developed by a Chinese corporation) performed better in Chinese-to-English translation as it seemed to have a better decoding of Chinese source texts.
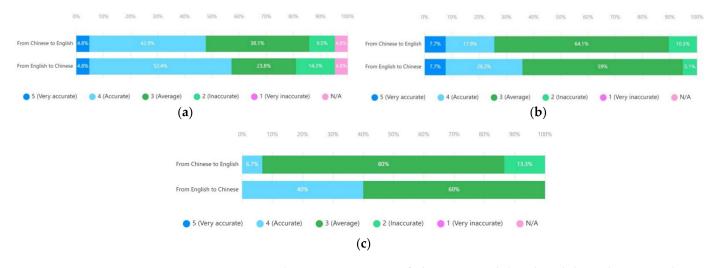
Figure 7. Perceived MT output accuracy of Chinese-to-English and English-to-Chinese translations: (**a**) undergraduate students (No UG students chose the "Very inaccurate" option); (**b**) postgraduate students (No MA students chose the "Very inaccurate" or "N/A" option); (**c**) instructors (No instructors chose the "Very accurate", "Very inaccurate", or "N/A" option).

Apart from the translation length and translation direction, which are two major factors included as close-ended questions in the survey, other factors that might influence the MT output quality were discussed in the interviews.

Interviewee 1 (*PG*, *aged 25*) and *Interviewee 5* (*instructor*) pointed out the possible connection between translation quality and the translation memory databases of different MT tools. According to *Interviewee 1*, the database of Eudic.net Translate included English news and dramas, so it used an "English mindset" to translate these text types from Chinese to English more naturally than Youdao Translate. Youdao Translate "has a large database of political translations and various (Chinese) work reports", so it worked better on these text types. *Interviewee 5* shared that no MT platforms could accurately translate old religious texts as their vocabularies and collocations were very different from modern language usage. This shows that the performance of MT tools is subject to the translation memory databases used.

Interviewee 2 (*PG*, *aged 22*) and *4* (*UG*, *aged 21*) both agreed that the MT output quality is closely associated with the technicality of text content. They commented that "MT tools performed quite well with regular texts" whereas they "performed the worst with texts containing technical terms".

Interviewee 3 (*UG*, *aged 21*), *Interviewee 5* (*instructor*), and *Interviewee 6* (*instructor*) mentioned the relationship between MT quality and text types. *Interviewee 3* and *Interviewee 6* found that MT could not translate literary texts well, especially those imbued with metaphors. *Interviewee 5* discovered that Google Translate performed better with commercial texts, while DeepL worked better with more formal text types, such as technical and academic texts.

3.4. Ethics

This section deals with participants' views on the ethical issues of MT use (Figure 8). Most of the UG (71.4%) and PG (61.5%) participants, and less than half of the instructors (45.7%), believed that the *degree of modification of raw machine-translated texts* was associated

with an ethical issue. However, *whether MT used in a graded assignment* constitutes an ethical issue was quite controversial among instructors, with 46.7% agreeing that MT used for such a purpose could be an ethical issue. To *Interviewee 6* (*instructor*), MT had no difference from other translation tools such as dictionaries and corpora. Translators should make good use of every tool, given that they paid their own effort to produce quality translations without directly copying from the MT outputs. Only 4.8% of the UG and 12.8% of PG participants claimed that *using MT in translation assignments does not involve ethical issues*. *Interviewee 4* (*UG, aged 21*) was one of those that made this claim, however, she added that a qualified translator should have the ability to judge and post-edit the texts whenever necessary. Interestingly, none of the instructors thought that *using MT in the translation assignments was always ethical*.
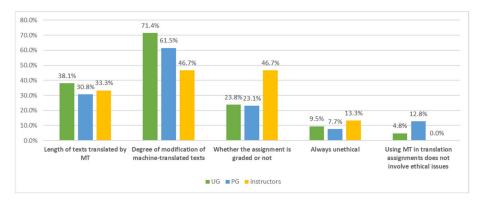

Figure 8. Ethical issue(s) associated with MT use.

3.5. MT and Translation Teaching

3.5.1. The Influence of MT on Translation Competence Acquisition

Figure 9 illustrates how learners perceived instructors' reactions and commented on using MT during translation teaching. Over half of the PG students *strongly agreed* or *agreed* that *instructors encouraged the use of MT* with *clear policies*. Meanwhile, nearly half of the UG respondents (47.6%) were *neutral* on the same question. Besides, a high percentage of both UG (71.5%) and PG (89.8%) respondents *strongly agreed* or *agreed* that *instructors had reminded them to be cautious when using MT*. The two *UG interviewees* reported that their instructors advised them to use MT to derive the basic idea of the source texts, and as an aid to increase efficiency. However, they were not encouraged to copy and paste machine-translated texts directly. *Interviewee 1* (*PG, aged 25*) experienced a change of mindset. She was reluctant to use MT at first, but began to do so because of the instructor's encouragement.
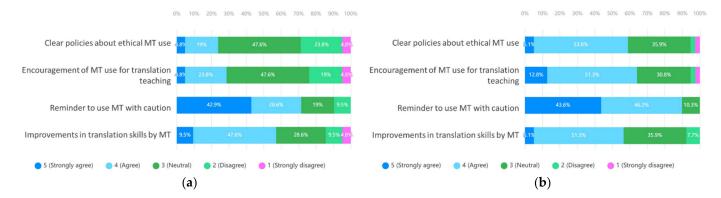

Figure 9. Learners' evaluations of instructors' attitudes towards MT and their own perceptions of MT use in translation teaching: (**a**) undergraduate students; (**b**) postgraduate students.

More than half of the respondents *strongly agreed* or *agreed* that *the use of MT improved their translation skills* (UG: 57.1%; PG: 56.4%). *Interviewee 1* (*PG, aged 25*) shared, "I think that

it is a tool to improve efficiency. In the process, you can also see a translation version that may be different from yours . . . I can learn during this process". All learner interviewees confirmed the necessity of MT use in translation teaching: "the benefits outweighed the disadvantages, so I would encourage everyone to use it" (*Interviewee 3, UG, aged 21*).

Figure 10 revealed instructors' evaluations of MT use in translation teaching. Interestingly, 60.0% of instructors *strongly agreed* or *agreed* that they *encouraged the use of MT in translation teaching* with *clear ethical policies*. Yet, this almost always came with a caveat, as 93.3% would *remind students to be cautious when using MT* and were *interested in knowing how to use MT to improve students' translation competence*. About two-thirds of the instructor respondents would *recommend useful MT tools to students*. Overall, the figures showed instructors' positive attitudes regarding learners' MT use. *Interviewee 5* (*instructor*) admitted that MT use by learners was unavoidable. Thus, she proposed some strategies to reduce the chance of plagiarisms in MT use: (1) provide machine-translated text together with the source text so that students have no chance to copy from the MT output; (2) ask students to work as a group to establish peer pressure through mutual monitoring.
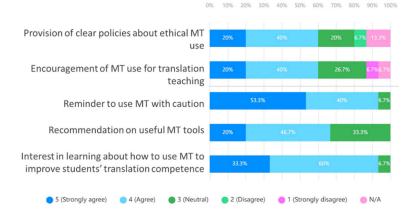

Figure 10. Instructors' evaluations of MT use in translation teaching.

Figure 11 indicated respondents' perceived usefulness of MT to enhance translation competence. Among different aspects listed in the translation competence model, most respondents believed that MT is *very useful* or *useful* to enhance their *knowledge to ensure the efficiency of the translation process* (UG: 80.9%; PG: 79.4%; instructors: 73.3%) and *lexical knowledge* (UG: 66.6%; PG: 79.5%; instructors: 80.0%). *Interviewee 1* (*PG, aged 25*) summarised her experience, "You don't have to spend so much time to . . . read it in English and understand it . . . You can also learn some new expressions". She explained that Chinese was her native language, and MT was beneficial for English-to-Chinese translation as it allowed her to capture the keywords and text meanings in Chinese quickly. The *other three learner interviewees* praised MT technology for improving their lexical knowledge. MT can suggest different expressions or synonyms for some words, phrases, and even slang. "It can enrich my lexicon" (*Interviewee 3, UG, aged 21*).

However, MT is deemed relatively *useless* or even *very useless* to enhance *bicultural knowledge* (UG: 52.3%; PG: 23.0%; instructors: 26.7%) and *knowledge about professional translation practice* (UG: 47.6%; PG: 17.9%; instructors: 26.6%). All learner interviewees agreed that MT was useless in this aspect. *Interviewee 1* (*PG, aged 25*) thought it was unrealistic for a young translator to have extensive cultural knowledge. "The first thing you need to do is being sensitive in the translation process . . . You are aware that the texts may contain some culture-specific concepts, then you have to do some online searching work".
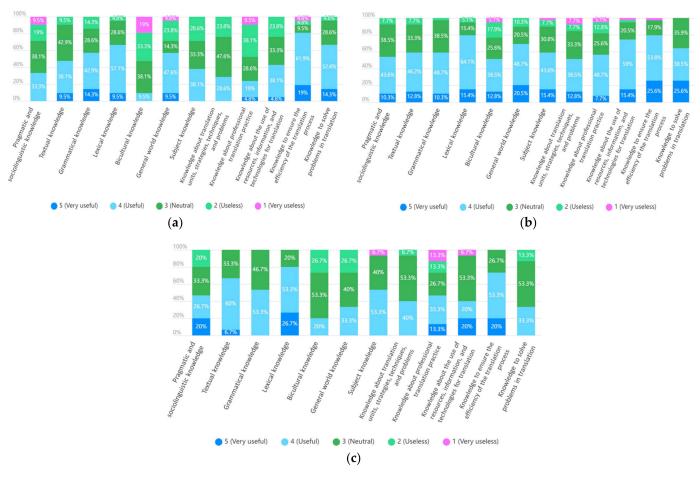
(a)

(b)

(c)

Figure 11. The usefulness of MT to enhance translation competence: (**a**) undergraduate students; (**b**) postgraduate students; (**c**) instructors.

Another drawback suggested by the interviewees was (over)reliance on MT. *Interviewee 1* (*PG*, *aged 25*) reported a lack of confidence without the help of MT, and *Interviewee 2* (*PG*, *aged 22*) said she would feel stressed if MT could not be used. Though *Interviewee 3* (*UG*, *aged 21*) and *4* (*UG*, *aged 21*) also reported a reliance on MT, they did not think it was a problem since the final translation products were largely based on their own judgements.

According to the instructor interviewees, learners' attitudes were essential in terms of the usefulness of MT to enhance translation competence. *Interviewee 5* (*instructor*) elaborated that MT could be treated as a teammate that helps the translator's comprehension of the source text and also provides a translation version for reference. Learners could also learn from analysing, questioning, and comparing between the MT outputs and their own translations critically. She also cautioned that MT could be an evil if the translators simply thought it could spoon-feed learners with the correct translation answers.

3.5.2. The Necessity of Including MT Training in the Course Curriculum

Among all the participants, 90.5% of UG students, 41.0% of PG students, and 73.3% of instructors had not received formal MT-related training before.

Regarding the pre-requisites for using MT to complete translation assignments, the majority of learners agreed with the importance of *being able to judge the quality of MT output* (UG: 85.7%; PG: 84.6%). However, *getting familiar with the advantages and limitations of MT tools* (80.0%) and *having basic knowledge of MT* (73.3%) were also rated as important by the majority of instructors (Figure 12). *Interviewee 5* (*instructor*) mentioned three things instructors could do to ensure learners fulfil the pre-requisites for the MT use: (1) checking the language proficiency in the entrance exam to see if learners are ready for using MT tools; (2) teaching learners how to work with MT; (3) explaining advantages and limitations of MT.
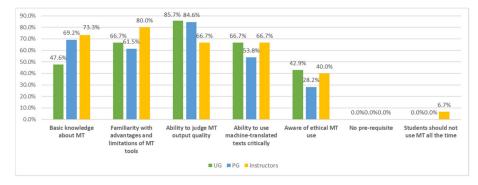
Figure 12. Pre-requisite(s) for using MT when completing translation assignments.

Figure 13 indicated respondents' attitudes towards MT training in translation curricula. Most participants *strongly agreed* or *agreed* that *it is necessary to incorporate MT into translation curricula* (UG: 76.2%; PG: 84.6%; instructors: 80.0%). Many learners are *interested in learning more about how to use MT to improve their translation competence in the future* (UG: 85.7%; PG: 89.8%). *Interviewee 1* (*PG*, *aged 25*) explained, "If you use the tools well and know more techniques than the others, it will be beneficial in terms of efficiency and quality". *Interviewee 4* (*UG*, *aged 21*) thought that an MT course could systematically introduce MT functions that users might overlook and some key elements that learners should be aware of while conducting post-editing.
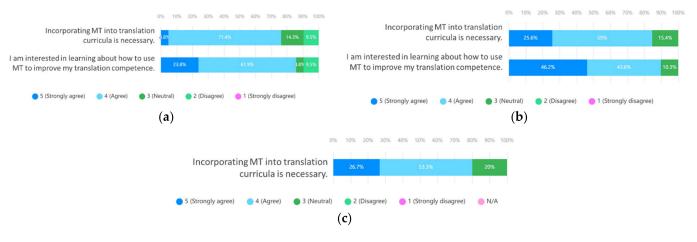

Figure 13. Attitudes towards MT training in the translation curriculum: (**a**) undergraduate students (No UG students chose the "Strongly disagree" option); (**b**) postgraduate students (No instructors chose the "Disagree" or "Strongly disagree" option); (**c**) instructors (No instructors chose the "Disagree". "Strongly disagree", or "N/A" option).

Interviewee 5 (*instructor*) revealed that translation technology was one of the academic streams in the translation department of her own university. Graduates of the translation technology stream could find more job opportunities. She described that skills in translation technology, including MT and translation memories, etc., are essential and need specialised training. *Interviewee 6* (*instructor*) also agreed that translation technology and post-editing have almost become translators' common knowledge in this information era. Students should be trained in this aspect in order to catch up with the fast-changing translation technology.

Interviewee 2 (*PG*, *aged 22*) and *3* (*UG*, *aged 21*) held an opposite viewpoint. They believed that MT was simple, and thus giving an MT course was not really cost-effective. Furthermore, current translation curricula have already covered the fundamental translation skills to handle various types of texts. These skills should be sufficient for a translator to edit machine-translated texts.

4. Discussion

This exploratory study investigated learners' and instructors' perceptions of and attitudes towards MT. Overall, the results showed the prevalence of and easy access to MT tools. Most respondents were not taught MT use in a formal course, but they used it frequently and quite skilfully. Most of them valued the convenience and efficiency of MT tools and platforms.

Learners were also concerned about MT accuracy, as reflected in the critical selection of their primary MT tool. Besides, most learners were more likely to treat MT as a supporting tool instead of one that could totally replace human translators. Besides, over half of the learner respondents recognised the usefulness of MT to improve their translation skills. A majority of learners were interested in learning how to use MT to enhance their translation competence and agreed that incorporating MT into translation curricula was necessary.

Generally speaking, instructors encouraged the use of MT in translation teaching, though they also cautioned that MT has some limitations which might hamper the acquisition of translation competence. They agreed that students need to be provided with transparent policies or guidelines out of ethical concerns (e.g., plagiarism issues). Many of them were also interested in knowing how to use MT to improve students' translation competence further.

The results clearly reflect the importance of MT in translation teaching. The survey and interview results suggest that MT can play an important role in the cultivation of students' translation competence. However, students need to be taught to critically evaluate MT outputs and also post-edit them for various translation purposes. Such issues have rarely been addressed systematically in previous studies. In the current study, we have addressed various linguistic and ethical issues related to MT as well as the potential and proper use of MT to inform translator training. In the next section, we make some further reference to the translation competence model proposed by PACTE [41] and MT literacy [45] to address the two research questions.

4.1. Perceived Usefulness of MT on Translation Competence Acquisition

The usefulness of MT can be understood in terms of the mechanisms used to design MT, the translation memory databases used in SMT and NMT, and the functions offered by individual MT tools. These aspects all hint at the usefulness of MT to develop learners' translation competence. In the following, we will relate how MT can contribute to the cultivation of various sub-competences using the PACTE translation competence model [41].

(1) Bilingual sub-competence

MT tools are pre-programmed with dictionaries and linguistic rules or connected to parallel text databases containing specific lexical and grammatical information. By offering alternative word choices, MT can function as a dictionary and thesaurus [16]. Hence, MT benefits learners in terms of vocabulary building, which is corroborated by both the undergraduate and postgraduate learners' survey and interview results. MT can also help enhance learners' grammatical knowledge as it can generate different translation versions for reference. In this regard, certain types of MT, if properly used, can contribute to the enhancement of learners' bilingual sub-competence. Nonetheless, its usefulness depends to a large extent on learners' language proficiency and critical analysis of the MT outputs.

(2) Extra-linguistic sub-competence

Bicultural, encyclopaedic, and subject knowledge constitute extra-linguistic sub-competence [41]. Since the design of MT is largely based on linguistic rules or existing translation memory databases, there is much scepticism over its capability to handle complicated text types. In the interviews, interviewees repeatedly mentioned that MT performed poorly in translating culture-specific items. Specifically, the interviewees mentioned that MT could not satisfactorily translate British humour and metaphors, as well as texts with cultural connotations. This corroborates previous findings that MT is inadequate

in handling texts with cultural elements [35]. Hence, as shown in the current study, MT is relatively not as useful in enhancing learners' bicultural knowledge.

As for SMT and NMT, their usefulness for developing learners' subject knowledge to cultivate extra-linguistic competence is associated with the translation memory database of the particular MT tool. For example, one learner interviewee explored an MT platform with translation memory of a large number of Chinese work reports and political texts, and found that the platform performed much better than other MT platforms when translating these text types. In this case, MT tools, when chosen properly, can be useful in terms of enhancing learners' subject field knowledge.

Some MT tools might have additional functions that can help enhance learners' extra-linguistic competence. As described by a learner interviewee, the MT tool she used provided hyperlinks to an online encyclopaedia. Users can obtain some related encyclopaedic knowledge easily by clicking the hyperlinks provided. Since this is not a primary function of mainstream MT tools, previous research rarely touched upon such issues. It is worth noting that the enhancement of various sub-competences through MT use depends on the features of individual MT tools and also users' willingness to make use of such features.

(3) Instrumental sub-competence

Instrumental sub-competence indicates knowledge about using resources, information, and technologies for translation [41]. Typical resources include dictionaries, grammar books, corpora, MT, translation memories (TM), internet search engines, and encyclopaedias. Therefore, knowledge and skills of MT use are connected to the development of instrumental sub-competence. There are two implications regarding competent MT use: the depth of MT knowledge and proper MT use. Given the user-friendliness of and easy access to MT, almost all respondents had no difficulty in using these tools through self-learning. This study echoed Xu and Wang's finding that teachers recognised the usefulness of CAT tools, but precautions must be taken [9]. As noted by one of the instructor interviewees, learners should know the limitations of MT in order to properly use MT outputs. Without fully understanding the MT mechanisms, it is questionable whether students can use it properly. These issues show that MT-related training is quite important.

Another issue about proper MT use is related to learners' ethical awareness. Based on the interview results, instructors did not encourage learners to directly copy machine-translated texts. Plagiarising machine-translated texts can be an ethical issue or even academic misconduct [16,38]. Some studies showed that MT can be used as a language resource instead of a quick fix in language learning contexts [46,47]. In the translation teaching context, translation instructors may need to think of some useful strategies to prevent students from plagiarising MT outputs. Merschel and Munné [48] proposed some punitive and preventive measures that instructors can adopt to dissuade L2 learners' MT use. Some of them may be applicable to translation classes. The punitive measures include mark deduction, redoing the assignment, and imposing penalties. The preventive measures include conducting in-class assessments and stating the requirements of expected outputs [48]. The measures adopted by *Interviewee 5* (*instructor*) are also preventive in nature. She suggested providing machine-translated text together with the source text so that students cannot plagiarise the MT output but only post-edit it. Besides, she also recommended that students work as a group to establish peer pressure through mutual monitoring.

(4) Knowledge about translation sub-competence

From the survey results, respondents are relatively conservative about treating MT as a means to obtain knowledge about professional translation practice. This implies that MT might not be very useful in terms of fostering learner's knowledge about translation. However, one instructor interviewee pointed out that learners who have the ability to challenge MT outputs are likely to raise insightful questions about translation methods in her class. This indicates that MT alone cannot help much in cultivating learners' translation competence. In order to make good use of MT, students must also be equipped with some basic translation skills so that they can show heightened awareness of potential translation problems.

(5)   Strategic sub-competence

The functions offered by MT tools can contribute to the development of strategic sub-competence, considering that MT can greatly increase translation efficiency. However, it should be noted that the quality and reliability of MT can sometimes be questionable [9,33], and post-editing is needed accordingly [3,10,31]. These are also reflected in the survey results, in which the respondents reported the various ways they handled MT outputs. Most respondents revealed that they used MT because of translation efficiency. According to the interviewees, MT can help increase translation efficiency in three ways. First, MT can help generate a rough draft of what the target text might look like. Second, MT allows an easier and faster understanding of the foreign texts when undertaking L2–L1 translation. Third, MT can perform an instrumental function as dictionaries and thesauri. As different translation tasks might require varying degrees of faithfulness [49], MT can be used strategically in cases where a lesser faithfulness can be accepted or tolerated. This thus points directly to the strategic sub-competence.

(6)   Psycho-physiological components

While MTs demonstrate varying degrees of usefulness in cultivating learners' expert knowledge or translation competence, the extent to which it is useful is still determined by learners' abilities (e.g., critical analysis, logical reasoning) and their attitudes regarding their interaction with MT (e.g., confidence in one's abilities, motivation, intellectual curiosity, a critical mindset). As illustrated by the translation competence model, all these aspects are closely related to the psycho-physiological components that contribute to expert knowledge [41]. In terms of the psycho-physiological components of the PACTE translation competence model, learners' attitudes towards MT play an essential role. The learners' attitudes have been repeatedly mentioned in the interviews. The most prominent case concerns the reliance on MT. Some interviewees would feel stressed or show no confidence without MT. Some perceived MT as a necessary tool, in the same way that no one would blame translators for using dictionaries. The second aspect concerns learners' motivations. As described by one of the instructor interviewees, MT serves as a helpful "peer" for students with high learning motivation. Differences between the MT output and students' own versions can trigger their curiosity and critical evaluation in order to identify the best translation approach. For those with low motivation, MT is an evil as it gives them a ready solution for their translation tasks or assignments. This also raises some ethical concerns over learners' (mis)handling of MT in their coursework.

Different perceptions of MT can influence actual use and perceived usefulness of MT in translator training context. Translation technology has played an increasingly essential role in this era of technology and digitalisation. It is foreseeable that people will rely more on MT or other CAT tools including corpora will become more prevalent in translation teaching [50,51]. Thus, maximising the values of MT by providing proper MT training to translation students can certainly contribute to translation academia, the translation industry, and the whole of society at large.

4.2. Perceived Necessity of Incorporating MT Training into Translation Curricula

In Europe, many translation programmes have already incorporated the teaching of necessary technological competence into their curricula [13]. However, this study found that most current translation learners have not received formal training in MT. While *Interviewee 5* (*instructor*) said that the translation programme in her institute offered a special stream in translation technology, *Interviewee 1* (*PG, aged 25*) felt disappointed as her translation programme did not provide an MT course at all. This suggests that translation technology is not a compulsory component in Hong Kong. As noted by Rodríguez De Céspedes [13], the translation curriculum is "still based on the traditional translation principles and cognitive processes", while slowly embracing the impact of translation technologies that the professional market usually needs.

Our study revealed that most respondents held positive attitudes towards incorporating MT training into the translation curriculum. The survey also showed that most learners had a rather superficial understanding of MT without fully knowing the mechanisms underlying MT. It is thus questionable whether they can use it properly to complete translation tasks satisfactorily.

An instructor interviewee stressed that translation technology, including MT, is an essential skill that demands specialised training. Knowing how MT works, how it can be effectively used in a specific context, and the implications of utilising MT for specific communicative needs are considered MT literacy [52]. According to Bowker and Buitrago Ciro [45], machine translation literacy as a new type of digital literacy needs to be developed by scholars. Likewise, student translators who are prospective professional translators should also be equipped with such literacy. Based on the survey and interview results, we thus propose a working definition of MT literacy in translation teaching settings:

(1) Understanding the mechanism of different MT platforms;
(2) Appreciating the broader implications of MT use;
(3) Being able to critically evaluate MT-translated outputs;
(4) Being able to modify or pre-edit a text for different MT platforms to translate;
(5) Being able to edit MT outputs to improve accuracy and readability;
(6) Knowing the advantages and limitations of MT;
(7) Understanding how different MT platforms and other CAT tools complement each other.

The above definition of MT literacy can be used to guide MT or translation technology courses. As suggested by some interviewees, students should make good use of the available tools to enhance their own competence in order to be more competitive in the market. Besides, the survey indicated that the majority of instructor respondents had not received formal MT-related training before. Thus, more research, seminars, and training courses are necessary to provide instructors with related information and equip them with the necessary competence to teach MT-related and translation technology courses.

4.3. Implications and Sustainability of MT

We have elaborated in the above that almost all MT platforms utilised translation memories. This means that the quality of MT outputs hinges on the quality of translation memories, which are ideally translated by human translators. As pointed out by Rodríguez de Céspedes [13], "MT and AI do not represent the only threat to translation practice as we know it, MT and AI cannot be solely blamed for bad quality translations because the source of these faulty translations come from corpora, term bases and algorithms created by humans including non-professional translators without a proficient linguistic background". In other words, if the translation memories are of a lower quality, the MT-translated contents cannot be expected to achieve high quality. In this regard, the human translators can directly or indirectly affect the quality of MT outputs. What we should bear in mind is that MT is not "one hundred percent" automatic and it actually recycles quality human translations to produce quality MT-translated contents. This has important implications for translation profession and translator training.

This means that uncritical use of the MT outputs might produce a vicious cycle whereby raw and unedited MT outputs might become translation memories of existing MT platforms. Given the fast-changing pace of our society in which new words and expressions are coined each day, we can expect that MT might not be sustainable if purely based on MT-generated memories. It is not exaggerating to claim that the sustainability of MT is largely determined by quality human translators who are trained professionally and equipped with proper translation competence. Thus, translator training programmes have a large role to play in this aspect and the sustainability of MT is closely related to the quality of translation trainees, who are tomorrow's professional translators.

5. Conclusions and Limitations

The present study investigates learners' and instructors' knowledge of MT, experience in MT use, perceived MT quality, ethics of MT use, and the perceived relationship between MT and translator training. Our purpose was to find out how MT can be properly used to enhance students' translation competence acquisition and whether MT training should be included as a necessary component in the translation curriculum. Our research has addressed these issues in the translation teaching context which have rarely been explored in previous studies. Our research efforts have yielded some new findings regarding the role of MT in translation teaching settings. The use of surveys together with interviews has provided both quantitative and qualitative data for us to examine how students and instructors used and perceived MT in a more comprehensive manner. Based on the findings, we have also explored the sustainability of MT from the perspectives of the translation profession and translator training.

Despite the findings, our study has some limitations. Since this study was designed as a preliminary exploration into the current state of and relationship between MT and translation teaching, the sample size is relatively small. The findings can be used as references for a more comprehensive and extensive study in the future. Additional experiments are encouraged to provide empirical support to examine how MT can enhance each aspect of translation competence and how MT literacy can be operationalised in actual teaching settings.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A Learner Survey

Knowledge about Machine Translation (MT)

1. To what extent do you agree with the following statements?

	5 (Strongly Agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly Disagree)
a. I know what Machine Translation (MT) is, such as what defines MT, and examples of MT tools and functions, before doing this survey.					
b. I understand the mechanisms that makes MT work, such as rule-based and statistical-based.					
c. I can use MT proficiently.					

Experience in using MT

2. In the process of completing translation assignments, how often do you use MT?

   o Always
   o Frequently
   o Occasionally
   o Rarely
   o Never

3. What is/are the reason(s) for using MT in the process of translation?

   ▢ Convenience
   ▢ Free of charge
   ▢ Satisfactory output quality
   ▢ Improve translation efficiency
   ▢ Learn from MT output
   ▢ Reduce workload
   ▢ There is no better alternative translation tool

4. In the process of doing translation assignments, how often do you use MT for the following purposes?

	5 (Always)	4 (Frequently)	3 (Occasionally)	2 (Rarely)	1 (Never)
a. Verify your own translations					
b. Check meanings					
c. Find synonyms, antonyms, or alternative words					
d. Check grammar structures					
e. Produce translated texts for direct use or post-editing					

5. When you use MT to translate sentences, paragraphs, or entire texts in the process of translation, how often do you handle the raw machine-translated texts in the following ways?

	5 (Always)	4 (Frequently)	3 (Occasionally)	2 (Rarely)	1 (Never)
a. Use the raw machine-translated texts without any modifications					
b. Make minor modifications, i.e., on the word level					
c. Make major modifications, i.e., on the sentence level					
d. Translate the texts by yourself with the assistance of MT					

Quality of MT

6. How accurate are the translated texts produced by the MT that you use most frequently for translating the following length of texts? (If you have never used MT to translate a certain length of text, please choose "N/A").

	5 (Very Accurate)	4 (Accurate)	3 (Average)	2 (Inaccurate)	1 (Very Inaccurate)	N/A
a. Individual words						
b. Short phrases						
c. Sentences						
d. Paragraphs						
e. Entire texts						

7. How accurate are the translated texts produced by the MT that you use most frequently in the following translation directions? (If you have never used MT to translate the text in a certain direction, please choose "N/A").

	5 (Very Accurate)	4 (Accurate)	3 (Average)	2 (Inaccurate)	1 (Very Inaccurate)	N/A
a. From Chinese to English						
b. From English to Chinese						

Ethics of using MT

8. Which of the following items are associated with the ethicality of using MT when completing translation assignments?
   - ☐ Length of texts translated by MT
   - ☐ Degree of modification of raw machine-translated texts
   - ☐ Whether MT is used in a graded assignment or not
   - ☐ Using MT in translation assignments is always unethical
   - ☐ Using MT in translation assignments does not involve ethical issues

MT and translation teaching

9. To what extent do you agree that MT is useful to enhance your translation competence in the following aspects?

	5 (Very Useful)	4 (Useful)	3 (Neutral)	2 (Useless)	1 (Very Useless)
a. Pragmatic and sociolinguistic knowledge of two languages					
b. Textual knowledge of the two languages					
c. Grammatical knowledge of the two languages					
d. Lexical knowledge of two languages					
e. Bicultural knowledge					
f. General world knowledge					
g. Subject knowledge					
h. Knowledge about translation units, strategies, techniques, and problems					

	5 (Very Useful)	4 (Useful)	3 (Neutral)	2 (Useless)	1 (Very Useless)
i. Knowledge about professional translation practice					
j. Knowledge about the use of resources, information, and technologies applied to translation					
k. Knowledge to ensure the efficiency of the translation process					
l. Knowledge to solve problems in translation					

10. Have you received any training in MT tools?

    o   Yes, in translation-related course(s)
    o   Yes, in other places
    o   No/self-learning

11. What do you think must be done before students use MT when doing translation assignments?

    □   Have basic knowledge about MT, such as functions and mechanisms
    □   Become familiar with the advantages and limitations of MT tools
    □   Be able to judge the quality of MT output
    □   Be able to use raw machine-translated texts critically
    □   Aware of the ethical issue of using MT
    □   Nothing must be done before one uses MT in translation assignments
    □   Students should not use MT in translation assignments all the time

12. To what extent do you agree with the following statements?

	5 (Strongly Agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly Disagree)
a. Instructors have clear policies about the ethical use of MT.					
b. Instructors encourage the use of MT for translation teaching.					
c. Instructors remind us that we need to be cautious when using MT.					
d. I think that the use of MT improves my translation skills.					
e. I think that it is necessary to incorporate MT into translation curricula.					
f. I am interested in learning more about how to use MT to improve my translation competence in the future.					

Personal Information

13. Native language(s)

    □   Chinese (Cantonese)

​​​​​​​​​​ Chinese (Mandarin)
​​​​​​​​​​ English
​​​​​​​​​​ Others _____

14. Gender

   o   Male
   o   Female

15. Age

   _____

16. Education level

   o   Undergraduate, year 1
   o   Undergraduate, year 2
   o   Undergraduate, year 3
   o   Undergraduate, year 4
   o   Master, year 1
   o   Master, year 2

Appendix B Instructor Survey

KnowledgeaboutMachine Translation (MT)

1. To what extent do you agree with the following statements?

	5 (Strongly Agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly Disagree)
a. I know what Machine Translation (MT) is, such as what defines MT, and examples of MT tools and functions, before doing this survey.					
b. I understand the mechanisms that makes MT work, such as rule-based and statistical-based.					
c. I can use MT proficiently.					

Experience in using MT

2. In the process of translation, how often do you use MT?

   o   Always
   o   Frequently
   o   Occasionally
   o   Rarely
   o   Never

3. What is/are the reason(s) for using MT in the process of translation?

   ​ Convenience
   ​ Free of charge
   ​ Satisfactory output quality
   ​ Improve translation efficiency
   ​ Learn from MT output
   ​ Reduce workload
   ​ There is no better alternative translation tool

Quality of MT

4. How accurate are the translated texts produced by the MT that you use most frequently for translating the following length of texts? (If you have never used MT to translate a certain length of text, please choose "N/A").

	5 (Very Accurate)	4 (Accurate)	3 (Average)	2 (Inaccurate)	1 (Very Inaccurate)	N/A
a. Individual words						
b. Short phrases						
c. Sentences						
d. Paragraphs						
e. Entire texts						

5. How accurate are the translated texts produced by the MT that you use most frequently in the following translation directions? (If you have never used MT to translate the text in a certain direction, please choose "N/A").

	5 (Very Accurate)	4 (Accurate)	3 (Average)	2 (Inaccurate)	1 (Very Inaccurate)	N/A
a. From Chinese to English						
b. From English to Chinese						

Ethics of using MT

6. Which of the following items are associated with the ethicality of using MT when completing translation assignments?
   ☐ Length of texts translated by MT
   ☐ Degree of modification of raw machine-translated texts
   ☐ Whether MT is used in a graded assignment or not
   ☐ Using MT in translation assignments is always unethical
   ☐ Using MT in translation assignments does not involve ethical issues

MT and translation teaching

7. To what extent do you agree that MT is useful to enhance students' translation competence in the following aspects?

	5 (Very Useful)	4 (Useful)	3 (Neutral)	2 (Useless)	1 (Very Useless)
a. Pragmatic and sociolinguistic knowledge of two languages					
b. Textual knowledge of the two languages					
c. Grammatical knowledge of the two languages					
d. Lexical knowledge of two languages					
e. Bicultural knowledge					
f. General world knowledge					

	5 (Very Useful)	4 (Useful)	3 (Neutral)	2 (Useless)	1 (Very Useless)
g. Subject knowledge					
h. Knowledge about translation units, strategies, techniques, and problems					
i. Knowledge about professional translation practice					
j. Knowledge about the use of resources, information, and technologies applied to translation					
k. Knowledge to ensure the efficiency of the translation process					
l. Knowledge to solve problems in translation					

8. Have you received any training in MT tools?
   o   Yes
   o   No/self-learning

9. What do you think must be done before students use MT when doing translation assignments?
   □   Have basic knowledge about MT, such as functions and mechanisms
   □   Become familiar with the advantages and limitations of MT tools
   □   Be able to judge the quality of MT output
   □   Be able to use raw machine-translated texts critically
   □   Aware of the ethical issue of using MT
   □   Nothing must be done before one uses MT in translation assignments
   □   Students should not use MT in translation assignments all the time

10. To what extent do you agree with the following statements?

	5 (Strongly Agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly Disagree)	N/A
a. I give students clear policies about the ethical use of MT.						
b. I encourage the use of MT for translation teaching.						
c. I remind students to be cautious when using MT.						
d. I would recommend useful MT tool(s) to students.						
e. I am interested in learning more about how to make use of MT to improve students' translation competence in the future.						
f. I think that it is necessary to incorporate MT into translation curricula.						

Personal Information

11. Native language(s)
     - ▫ Chinese (Cantonese)
     - ▫ Chinese (Mandarin)
     - ▫ English
     - ▫ Others _____

12. Gender
     - o Male
     - o Female

13. Age

     _____

14. Total no. of years teaching translation-related course(s) for Undergraduate or Master students

     _____

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