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Technology and Translator Training

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Abstract

There is broad consensus in the literature that anyone who wishes to become a professional translator of pragmatic and technical texts should acquire an understanding of, and an ability to use and critically appraise, contemporary translation technologies. But there are other good reasons for students to know about translation technology: an understanding of contemporary translation is almost impossible without such knowledge; and broad technological competence can contribute to critical citizenship. This Chapter surveys the growing body of scholarship that deals with the teaching and learning of translation technology, principally in academic settings. This literature addresses everything from curriculum and syllabus design—and their ontological, epistemological and ethical underpinnings—to teaching methodologies, modes of delivery, and the assessment of teaching and learning. The Chapter tracks how training in translation technology has evolved with the technologies themselves, but also with the general shift from transmissionist to constructivist approaches in translator education, and highlights the affinity between the area and situated and embodied cognition, on the one hand, and workplace-based learning and research, on the other. It concludes with some reflections on the challenges that arise in the context of the growth of machine learning, and on the relationship between industry and academia.

Keywords: translation technology, pedagogy, teaching and learning, social constructivism, situated cognition, employability

Introduction

There is broad consensus in the literature that anyone who wishes to become a professional translator of what Venuti (2017) calls 'pragmatic and technical texts' should acquire an understanding of, and an ability to use and critically appraise contemporary translation technologies.[1] Without the requisite technical knowledge and skills, it is argued, graduates of university translator training programmes will not be able to compete for work in a highly technologized field. Nor will they be able to meet the demands of an industry that requires ever-increasing volumes of translation to be done on a scale and at a speed and cost that are simply unimaginable using exclusively 'human' means. Like the tools themselves, technological knowledge and skills are thus generally viewed instrumentally: their acquisition is a means to an end

for anyone whose goal it is to become a translator (Kelly 2005: 74-5). But there are other good reasons for those interested in translation to engage with translation technology. One is that translation, as a practice that relies principally on reading and writing, is simply inconceivable without technology (Cronin 2003), and a full understanding of translation thus requires an appreciation of how the work of translators through the ages has been enabled and shaped by available technologies. Such appreciation can be extended to whole sociotechnical systems in which translation plays a part, and represents an important emerging stream in translation studies, even in those sources not explicitly concerned with the training of translators (see, for example, Littau 2016; Ehrensberger-Dow and Massey 2017; Olohan 2017). One could thus argue that a nuanced understanding of how technology and translation are intertwined should be a vital ingredient of any broad education in translation studies, even if the instrumental acquisition of technical skills remains closely aligned with translator 'training' agendas.[2] But fuller understanding of the interaction between translation and technology is not just good for students *qua* scholars of translation. Given that some of the most influential technologies currently in use in the translation industry rely to a large extent on the same machine learning methods as those used in other branches of the economy, and that these methods now pervade private, professional and public life, time spent attempting to understand the inner workings of certain translation technologies is time well spent, as the conceptual models we build, and insights we gain, can be fruitfully transferred to other important aspects of contemporary life. If, as Kelly (2007: 135) reminds us, current thinking in higher education is very concerned with 'generic competences', namely 'those which will facilitate incorporation into the world outside university, into the world of work and society at large as critical citizens, together with preparation for lifelong learning', then technological competence need not stand apart from such generic competences, as there is a strong argument that a good technological education can make a significant contribution to the development of critical citizenship, for example (de Vries 2016: 7; Domingos 2017: xvi). In other words, technological competence need not be merely 'instrumental' in Kelly's (2005) sense.

For this author in any case, a well-informed understanding of how translation and technology go hand in hand should form a part not just of any sharply focused, professionally oriented translator training programme, but also of any more broadly defined education in translation studies. This view is not necessarily reflected in the literature however, with some well-known references on translation pedagogy mentioning technology only fleetingly, or not at all. Kelly's (2005) engagement with technology, for example, is limited to her brief observations on 'instrumental competence' alluded to above; while the contributors to Venuti (2017), with the exception of Massardier-Kenney (2017), barely mention translation technology.

That said, there is a growing body of scholarship that deals with the teaching and learning of translation technology in academic settings. This literature addresses everything from curriculum and syllabus design—and their ontological, epistemological and ethical underpinnings—to teaching methodologies and resources,

modes of delivery, and the assessment of teaching and learning. There are also surveys of industry trends, employer needs and teaching practices in individual countries and across whole regions (Plaza Lara 2017). Some accounts deal with translation technology in general, while others focus on the use of translation or related tools in specialized areas such as localization or audiovisual translation. These various sources inform most of the discussion of translation technology in translator training below. Our survey of technology and translator training begins with a brief historical overview. It then moves on to address the above-mentioned aspects of curriculum and syllabus design, methodologies, etc., before discussing critical and emerging issues in the field.

It should be noted, however, that training in translation technology happens not just in universities and other higher education institutes, but also as part of the continuous professional development of individual translators working in the translation departments of large organizations or for language service providers. Technology providers themselves also offer training in the use of their tools, for example through online tutorials, demos and webinars, and training is also available through professional associations.

A brief history of translation technology education

The links between translation and technology in its broadest sense are ancient and profound, but the technologies that are of most interest to us in this Chapter are relatively new, dating only from the mid-to-late twentieth century. These digital technologies include machine translation (MT) and computer-aided translation (CAT), itself an umbrella term for a variety of tools and processes used by contemporary translators.[3] They also include localization tools, used in the translation and adaptation of software, websites, videogames and other digital products. But if these technologies are relatively young, then their integration into translator training is younger still. The first MT systems went into operation in the 1960s but it was not until the 1980s that translator training establishments began to integrate practical MT into their curricula. Early adopters included UMIST, Manchester, in the UK, who had been teaching MT theory since the mid-1970s (Somers 2001: 25); Dublin City University in the Republic of Ireland, where the ALPS Translation Support System was being used in translator training in 1988;[4] Carnegie Mellon University, which was unique in the early 1990s in being the only site in the United States that used MT technology in courses leading to a degree or certificate in translation (Wältermann 1994: 310); and the University of the Saarland in Saarbrücken, Germany, where MT had been introduced as a subject on translator training programmes in 1990, and the Logos MT system was in use from 1992 (Haller 1995: 34). Indeed, translator-training programmes in Germany appear to have been quick out of the blocks when it came to instruction in translation technology, with Hartley and Schubert (1998) noting the influence of the German translators' and interpreters' association, the *Bundesverband der Dolmetscher und Übersetzer* (BDÜ 1986), in encouraging translator training providers to update their curricula to take account of contemporary work practices.

In the late 1980s and early 1990s, MT thus featured on a small number of translator training programmes. There was widespread scepticism at the time about the usefulness of MT for professional translators and irritation at how the technology was hyped, and those teaching MT often had to justify their decision to do so in terms of skills it allowed students to develop that went beyond those required to directly deploy MT systems. Haller (1995) for example, noted that learning about the linguistic rule-based systems of the day gave translation students an entrée into computing, and helped them to think using the conceptual tools of mathematics and logic, and to formulate translation problems using a suitable metalanguage, among other things. In other words, it broadened their intellectual horizons. And even if the dominant paradigm in MT has since shifted from rule-based systems to statistical systems, and more recently to neural approaches, the general point that learning about currently dominant approaches to computation is a valuable thing to do remains valid to this day.

By the mid-1990s, however, MT had been eclipsed by translation memory as the technology of choice among technical translators, and university training programmes began integrating translation memory, along with related technologies whose utility was self-evident to translators—in particular terminology management systems—into the translation curriculum. Kenny (1999) describes early experiences of integrating these technologies into translator training,[5] drawing attention to the ways in which tools designed to support existing translation and terminographic practices ultimately contribute to changing those very practices, and arguing that education environments are good ones in which to observe such change. The influence of tools on the changing nature of translation, and its implications for translator training, is a recurring theme in the literature and is taken up again, for example, in Bowker (2002), Pym (2011) and Desjardins (2017).

The early 2000s saw the publication of several short descriptions of translator training programmes that integrated translation technology. English-language descriptions appeared mainly in the trade magazine *Language International*, and often discussed training needs in the burgeoning field of localization alongside those in 'conventional' translation. The turn of the millennium is also associated with the expansion of roles in the burgeoning language industry beyond those previously associated with 'translation and interpreting' as well as the popularization of the term 'language service provider' as a rhetorical response to this expansion (see, especially, Maia 2002: 9). These years also saw the founding of entirely new university programmes in the broad area of localization, which included dedicated modules in translation technology,[6] and of programmes in the broad area of translation and technology, some of which also offered dedicated modules in localization.[7] Chan (2010: v) mentions three UK-based programmes in translation and translation/language technology that started between 2000 and 2005, and sees as particularly significant the inauguration of the MA in Computer-Aided Translation in 2002 by the Chinese University of Hong Kong. By this time, Chinese software companies had begun to make inroads into an

industry that had thus far been dominated by North American and especially European companies (Chan 2017: 9), and translation technology was on the cusp of what Chan describes as 'a period of global development' (ibid.: 13).

The early 2000s also saw the publication of the first major English-language textbooks in computer-aided translation, namely Frank Austermühl's (2001) *Electronic Tools for Translators* and Lynne Bowker's (2002) *Computer-Aided Translation Technology. A Practical Introduction*. These sources largely complemented existing textbooks on MT (Hutchins and Somers 1992; Arnold et al. 1994; Trujillo 1999). Although Austermühl (ibid.) included a short chapter on MT, his and Bowker's (ibid.) main focus was on the tools that had found their way into everyday use among professional translators, whether for use in 'translation proper', as in the case of terminology management systems and translation memory tools, or in ancillary activities, for example file conversion and transfer. Austermühl included introductions to the internet and the world-wide web, and a discussion of resources available online and on CD-ROM, revealing a desire to help readers transition from paper-based to digital media. Both Austermühl and Bowker also included chapters on corpus tools. Like the only other major textbook on translation technology published in English in the 2000s, C. K. Quah's (2006) *Translation and Technology*, these books were aimed primarily at translation students and trainers, and possibly also translation professionals. Their main concern was to explain how technologies worked, and what they were good for. This does not mean that these writers ignored broader professional and economic issues—Bowker, for example, addresses issues of payment and data ownership in the context of translation memory usage—rather, their focus is on technological artefacts, for example software tools, and their intrinsic characteristics and functions.

While Austermühl (2001) and Bowker (2002) provided guidance on *what* could be taught, they did not say much about *how* to teach the subject. Around the same time, a conversation started between translator trainers on this very matter: between 2001and 2003 the European Association for Machine Translation (EAMT) and the Association for Machine Translation in the Americas (AMTA) devoted three workshops to the teaching of MT (Forcada et al. 2001; EAMT/BCS 2002; AMTA 2003). The workshops mark the beginning of systematic thinking about the teaching of translation technology.[8] While few of the contributions were explicitly informed by contemporary pedagogical scholarship (on education in general or translator training in particular), they did nonetheless address issues of interest to all pedagogues, for example, syllabus design, the differing needs of different types of student, teaching methodologies, teaching environments, class exercises and assessment methods. Other notable additions to the incipient literature came in 2003, in Harold Somers' *Computers and Translation. A translator's guide*, which included a chapter on 'Machine Translation in the Classroom', and presented a series of practical activities, some of which were optimized for use with then prevalent rule-based MT systems, and Pym et al.'s (2006) *Translation Technology and its Teaching*, which addressed a broad range of technologies, and much of which was concerned with the boundaries

between localization and translation.

The 1990s and 2000s are also notable for a series of international projects designed to ascertain industry needs, survey existing translation technology training in higher education institutes, propose curricula, and generate teaching materials, among other things. In 1998 the now defunct Localization Industry Standards Association (LISA) commissioned the LISA Education Initiative Taskforce to evaluate training needs in the field (Esselink 2000: 10), but it was the European Union that engaged most wholeheartedly in the sponsorship of such projects, supporting a series of initiatives known by a colourful stream of acronyms including: LETRAC (1998-99), which among other things proposed a curriculum for trainee translators that included an 'Introduction to Computer Science', and modules on 'Information Technology', 'Desk-Top Publishing for Translators' and 'Language Engineering';[9] eColore (2002-05), which provided resources for use in localization training, including 'sample texts and scenarios for their pedagogic exploitation in realistic, task-oriented settings'; [10] eColoTrain (2005-07), which focused on improving the ICT and localization skills of translation trainers rather than trainees, and used resources created in the eColore project;[11] eColoMedia (2007-09), which set out to help professional translators and translation students respond to growing needs in multimedia translation;[12] and Mellange (2004-07), which concentrated on designing methodologies and resources for e-learning modules that could be part of a European Masters in Translation and Technology.[13] While it is undoubtedly true that the above-mentioned projects made important strides in improving technological competence among their participants during the projects' lifespans, their wider and longer-term impact can sometimes be difficult to judge, as websites are not maintained beyond projects' end dates, links die, and carefully crafted resources eventually become inaccessible. Against this background accounts of such projects published in conference proceedings and refereed journals, for example Secară et al. (2009a, 2009b), become all the more valuable.

Another project dating from the late 2000s is the Collection of Electronic Resources in Translation Technologies, or CERTT (Bowker and Marshman 2010; Marshman and Bowker 2012). Launched by the University of Ottawa's School of Translation and Interpreting in 2007, but quickly gaining pan-Canadian significance, CERTT's general aim was 'to demystify translation technologies for translator educators and students and to facilitate a more extensive and authentic integration of such tools into academic life and beyond' (Bowker and Marshman 2010: 202). The project developed a series of tutorials and exercises on a wide range of electronic tools of interest to translators, as well as 'a large bank of complementary documentation and resources, including sample source texts, corpora, bitexts and termbases for use with the tools' (ibid. 204) and made these available through its public website[14] and through the LinguisTech portal.[15]

A very significant intervention by the European Commission's Directorate General

for Translation (DGT) was the setting up of the European Master's in Translation (EMT) Network in 2009 with a view to improving the quality of translator training across Europe and the employment prospects of young language professionals. As the core of the project is the EMT translator competence profile, which defines 'the basic competences that translators need to work successfully in today's market'.[16] Membership of the EMT Network is based on a competitive call, and those admitted to the network are obliged to provide adequate training so that trainee translators can achieve the competences in question. Unsurprisingly, these competences include 'technological competence'. Students who graduate from an EMT programme are thus expected to know how to use a variety of text processing, terminology management, and translation memory tools, among others; how to create and manage databases; how to adapt to new tools, especially those designed for the translation of multimedia and audiovisual material; and how to prepare and produce a translation in different formats and for different technical media. The EMT competence framework has evolved with a changing technological environment: in its earlier iteration, graduates were expected to know the 'possibilities and limits of MT', as part of their technological competence (EMT Expert Group 2009). By 2017, the framework had elevated 'the ability to interact with machine translation in the translation process' to the status of 'an integral part of professional translation competence' (EMT 2017: 7). The EMT competences are now widely cited in the literature on translation pedagogy and are used, according to their authors, as a model for translator training curricula within Europe and beyond (EMT 2017: 2).[17]

Spin-out projects from the EMT include OPTIMALE, which ran from 2010 to 2013.[18] Like other projects before it, one of its main aims was to monitor needs in the translation industry. It also sought to disseminate best practice in translation training among its 70 member universities, and to provide training for trainers. Much of the training it provided related to innovative practices in the teaching of technologies that support translation, including corpus tools, CAT tools and Statistical MT.

Another important development in the 2000s was the launch of a number of journals that focused either on the previously neglected 'Cinderella' area of translation and interpreting pedagogy (Kelly and Way 2007: 5), translation technology, or 'specialized' translation. These journals, most notably *The Interpreter and Translator Trainer* (founded in 2007), *Revista Tradumàtica* (2001) and *The Journal of Specialised Translation* (2004), would go on to provide a welcome platform for pedagogical reflection on translation technology.

The 2000s are and 2010s also saw diversification in translation pedagogy with increasing interest in areas such as audiovisual translation and various types of localization. The first English-language book dedicated to 'the didactics of audiovisual translation' was published in 2008 (Díaz-Cintas 2008a). Given what its editor calls the 'umbilical relationship' between '[a]udiovisual translation in general, and subtitling in particular', on the one hand, and 'technology' on the other (Díaz-

Cintas 2008b: 4), this volume inevitably deals with the teaching and learning of software tools used in the various types of subtitling and in audio description. Translation memory and MT have, however, thus far been less commonly used in audiovisual translation and videogame localization than, for example, in software or web localization (O'Hagan and Mangiron 2013: 97, 142-3). That said, O'Hagan and Mangiron (ibid.: 145) see this changing as the game localization industry continues to grow, games become bigger and more complex, and pressure to ship games simultaneously in multiple languages mounts. They go on to address training needs in game localization in their 2013 book, and provide a descriptor for a postgraduate module in the area, a descriptor which, in turn, assumes that students are already familiar with software localization, terminology management, translation memory, dubbing and subtitling, and their attendant tools (ibid.: 260). Likewise, Jiménez-Crespo, whose book on web localization appeared in the same year, includes a detailed discussion of training needs in web localization, much of which focuses on the acquisition of competence in translation (and related localization) technologies (2013: 161ff.). More recently, attention has shifted to translation in the context of online social media (OSM), with Desjardins (2017) arguing that trainee translators need to acquire OSM competencies, if they are to be able to compete in the workplace with 'elite bilinguals with more 'attractive' disciplinary profiles' (2017: 67), and highlighting some of the priorities that such training might address. Other commentators note the increasing importance of MT in the profession, and the need for translator training to keep up (Mellinger 2017), as well as the need to integrate machine learning more generally into translator training (Kenny 2018a; Massey and Ehrensberger-Dow 2017).

Epistemology

According to Don Kiraly (2003: 4):

> the first step in the process of creating any educational approach must be the specification of the underlying epistemology, that is, our understanding of what it means to know and to learn. These philosophical underpinnings will form the essential conceptual foundation that will inform, justify and link together all subsequent stages of teaching, from curriculum and syllabus design to the creation of classroom techniques and methods of evaluation.

The epistemological basis of Kiraly's own teaching (Kiraly 2000, 2003) has been social constructivist for much of his career, albeit with recent expansion 'to encompass a post-modern ontology and epistemology' (2013: 202), which in turn draws heavily on complexity theory, and especially the concept of emergence. An emergent view of the development of translator competence would suggest that 'such competence is not built up bit by bit through the accretion of knowledge, but creates itself through the translator's embodied involvement … in actual translation experiences' (Kiraly 2013: 203). If social constructivism already extolled the virtues of authentic, experiential learning, as well as the staples of non-transmissionist

teaching, learner-centredness and collaboration (see Kiraly 2000), then the emergent approach makes even more of authentic, experiential learning, with the workplace becoming the educational site *par excellence*. Workplaces can, however, be 'simulated' in academic environments, in initiatives such as those discussed by Kiraly himself (2013: 215ff.) and by members, for example, of the International Network of Simulated Translation Bureaus (Buysschaert et al. 2017).[19] The emergent approach also calls into question 'conveniently labelled sub-competences' (Kiraly 2013: 208), but this does not prevent those involved in simulated translation bureaus from giving a special prominence to 'technological competences', given their particular significance in the workplace (Buysschaert et al. 2018). The simulated translation bureau approach is, however, seen as allowing for a 'holistic' approach to the development of such technological competence (Buysschaert et al. 2018: 126). Finally, Kiraly's (2013) emergent approach also clearly draws on the idea of translation—and thus learning to translate—as involving situated, embodied cognition as discussed by Risku (2010). As Krüger (2016: 298) puts it, situated translation 'assigns central importance to the individual situational factors of the translator and his/her working environment.' Such factors inevitably include technological artefacts. Embodiment too calls attention to the materiality of translation, problematizing previously dominant 'anti-physical' approaches that prefer to see translation as involving some kind of 'ethereal state' (Littau 2016: 85, 89). Instead, translators are seen as being part of 'a material, medial and technological ecology that shapes every aspect of mind' (Littau 2016: 85). Massey and Ehrensberger-Dow (2017) have also embraced the view of translation as situated cognition, claiming that translation is 'done by the mind in conjunction with the complex physical environments and socio-technical systems in which the act of translation takes place' (2017: 304). And against the backdrop of the rise of machine learning in translation, in which machines learn largely based on data supplied by humans, they argue that 'translators can and do learn with and from the machines that assist them' (Massey and Ehrensberger-Dow 2017: 305). Situated cognition approaches to translation—and translation pedagogy—thus give serious attention to technology; the focus on embodiment is also consistent with an interest in physical and cognitive ergonomics and their integration into translator training, as addressed, for example, in Lavault-Olléon (2011) and Massey and Ehrensberger-Dow (2017: 307-308).

Ontology

At some level pedagogy must also concern ontology, a consideration of what exists in a domain, what the domain's internal structure is, where its boundaries lie, and, by extension, what we should attend to in teaching about that domain. The educational benefits of clear taxonomies, for instance, are obvious: once students have learned about the general class, they can confidently transfer their new knowledge to specific instances. Likewise, there are obvious institutional reasons for establishing boundaries to a domain: they allow universities and other stakeholders to develop syllabi and assign teaching and other resources to given cohorts of students. What is perhaps more surprising is the variety of ontologies related to translation technology proposed

in the literature, and the vehemence with which different positions are defended. Classifications of translation technology change over time and can be based on a variety of criteria: Hutchins and Somers (1992), for example, classified technologies depending on the degree of mechanization they offered, and by extension, where the burden of effort fell—with the machine or the human —giving us a continuum that ran from 'Machine Translation' through 'Human-Aided Machine Translation' and 'Machine-Aided Human Translation' to 'Human Translation'. The term 'Computer-Aided Translation' or 'CAT', sometimes seen as a synonym for 'Machine-Aided Human Translation', found favour with most authors in translation pedagogy (e.g. Bowker 2002; Quah 2006). CAT tools, and especially translation memory tools—technologies devised to support human translators—were increasingly juxtaposed with 'Machine Translation'—a technology that tried to replace human translators (Bowker 2002: 4), or at least risked 'reducing' them to post-editors (Koehn 2010: 23). The bifurcation of translation technology into MT and CAT thus reflected not just differences inherent in the technologies, but also helped to create two different communities of practice, with translation technology pedagogy for a long time more interested in CAT than MT.

For the most part, earlier commentators (e.g. Schubert 1995; Austermühl 2001; Bowker 2002) included in their lists of technologies to which translator trainers and trainees should attend, those seen as most important at the time, whether they were generic text processing tools or search engines, or tools specific to the translation process (e.g. translation memory and terminology management tools). Austermühl (2001) further categorizes 'electronic tools for translators' according to the phase of the translation process in which they are used: source text reception, transfer, or formulation of the target text. Melby (1998), cited in Alcina (2008), similarly divides technologies according to phases of translation, but also according to whether they are used at the level of term or whole segment. In later publications Austermühl differentiates between tools (or functions of tools) used by localizers and those used by translators (Austermühl 2006), reflecting the preoccupation with the boundaries between the two profiles at the time, or focuses on 'meta-competences' required in translation, namely revision skills and documentary research skills, suggesting that we might view translation technologies simply from the point of view of whether they allow students to optimize these skills (Austermühl 2013). The latter position is taken in the interest of developing teaching and learning 'that is less a knee-jerk reaction to market developments than a sustainable and critical discussion of the relevance and impact of the various tools' (Austermühl 2013: 327) and against the background of an industry that tended to exaggerate the innovative nature of its products (ibid.). According to Austermühl, despite industry hype, there had not really been 'a conceptually new tool since, possibly, the advent of software localization tools' (ibid.). He thus optimistically concludes that 'knowing what to teach should not be so difficult and surely not as volatile an issue as one might think' (ibid.)

Krüger (2016: 320-326), taking a situated cognition perspective, divides technologies relevant to translation into several 'artefact groups' including: 'translation technology in a narrow sense', which covers familiar CAT tools and MT, and has a particular bearing on the translator's cognition, and 'translation technology in a wider sense', which includes 'all other software tools besides specific CAT tools which the translators uses in the translation process' (ibid.: 322). Such tools are seen as having a lesser bearing on the translator's cognitive performance. Other artefact groups of interest to Krüger are 'digital research and communication resources' and 'general working aids', the latter of which should be given more attention in translation studies, according to Krüger (ibid.: 324-325), in the light of ergonomic studies of the translation workplace, for example, Ehrensberger-Dow and O'Brien (2015).

Other ontologies have been reviewed by Alcina (2008), who also makes a crucial distinction between 'tools'—computer programs that can manipulate data in various ways—and 'resources'—data sets that are 'organised in a particular manner and which can be looked up or used in the course of some phase of processing' (2008: 94). The variety of such ontologies serves as a reminder of their constructed nature, and the fact that what we need to attend to changes over time, or according to our priorities. Their necessary mutability does not, however, suggest that all ontologies are equally useful in teaching. Chan (2017), for example, lists no fewer than twenty two different types of machine translation, in an unstructured list of overlapping and sometimes idiosyncratic categories that was already out of date on its publication, neglecting, as it did, to mention neural MT.

The ontological consensus to which Austermühl (2013) appears to allude has been challenged by what is commonly described as the 'blurring' of technologies, with translation memory data frequently being used as training data for MT engines for example, and translation memory interfaces being used to post-edit MT outputs. The differentiation between human and machine translation is further called into question in interactive, adaptive MT, such as that provided by Lilt, who coyly describe their product as 'the next generation of human/machine translation' (Lilt 2017). Against the backdrop of such technological developments, Castilho et al. have gone so far as to claim that 'the traditional separation of human and machine is no longer valid, and drawing an arbitrary line between HT and MT no longer serves us in research, teaching and professional practice' (Castilho et al. 2018: 28). But while it may be true that, in certain environments, it is difficult to distinguish human from machine inputs and outputs, this does not mean that the distinction does not hold in other environments, or historically, or in pedagogical approaches that sequence learning so that students acquire (or construct) the concepts linked to translation memory, for example, before embracing MT. Massey and Ehrensberger-Dow (2017: 308) further argue that, in the age of machine learning, students need to be 'aware of the added value of human translation' and 'able to deliver it'. Scenarios that do not allow differentiation between human and machine translation might preclude the development of high-quality human translation, in the present author's view. Finally,

rather than seeing the untraceability of a translation as a reason to ignore origins, it might instead be viewed as an opportunity for students to reflect critically on the increasing opacity of translation and other processes.

Methodology

Once our ontological basis is clear, we can decide on curriculum contents, but how these contents are 'delivered' is another matter entirely. There is a strong preference in much of the literature (e.g. Pym 2013; Austermühl 2013; Enríquez-Raído 2013; Massey and Ehrensberger-Dow 2017; Mellinger 2017) for 'transversal' delivery, in which translation technology would become the object of learning as and when the need arises across the entire translator-training curriculum. Most published syllabi or activity descriptions, however, relate to stand-alone modules (or parts thereof) on translation technology generally, or on more specific technologies, such as MT or translation memory, or activities such as post-editing (see, for example, Luo 2010; Doherty and Kenny 2014; Flanagan and Christensen 2014; Koponen 2015; Rossi 2017; Killman 2018; Moorkens 2018; Rodríguez-Castro 2018; Guerberof Arenas and Moorkens 2019). In most cases, delivery involves a mixture of lectures and lab work. Pym (2013) pays particular attention to the physical spaces in which teaching and learning occur, expressing a preference for configurations that allow students to collaborate and use their own computers.

A number of authors promote the use of learner-centred, active and situated pedagogy through, for example, task-based or project-based learning (see, for instance, Rodríguez-Castro 2018 and Guerberof Arenas and Moorkens 2019). Rico (2017) advocates use of ePortfolios. There are some discussions of the various modes in which teaching and learning can take place: face-to-face is the default option, but e-learning (Shuttleworth 2010) and, more commonly, blended learning (Secară et al. 2009a; Xu 2010) are also possible. Rodríguez-Castro (2018) also uses virtual reality simulations in her teaching. Syllabus-oriented publications usually outline how student learning outcomes are assessed—often on the basis of project work and/or reflective essays—and may also describe student self-evaluations of their learning or evaluations of the module itself (e.g. Doherty and Kenny 2014; Rodríguez-Castro 2018).

While most academic scholarship on translation technology pedagogy is concerned with industry-standard artefacts that exist independently of the researcher, a small body of work involves artefacts that have been created or adapted by the researchers with the express purpose of supporting pedagogy. Babych et al. (2012), thus extend an existing web platform to give it scaffolding and tracking functions that are useful in pedagogical practice and research related to collaborative translation. The MTradumàtica statistical MT platform was also created primarily with pedagogy in mind and offers glimpses into the internal workings of the technology to this end (Martín-Mor 2017).

Critical and emerging issues

A feature of earlier reflection on translation technology pedagogy was an anxiety about students acquiring 'how to' or 'procedural' knowledge—constructed somewhat reductively as knowledge of 'which buttons to press' (see, for example, Clark et al. 2002: 68; Baer and Koby 2003: x)—at the expense of 'conceptual knowledge' or 'general principles'.[20] This anxiety may have been borne of a defensiveness caused by the perceived lower status of 'practice' in the academy, the newness of translation technology to translator training programmes at the time, or the general 'slighting' of the material in the social sciences (Sennett 2009). As the technologies became more familiar, and as pedagogy embraced competence frameworks that valorize the procedural (PACTE 2005), as well as situated cognition and other 'ecosystemic' approaches (Krüger 2016), and as translation studies in general began to integrate the material into thinking about translation, these fears appear to have dissipated. Commentators are, of course, still eager for students to develop both skills in using specific tools and general knowledge of those tools (e.g. Bowker 215: 93). They also recommend that translator training provide a framework within which students' critical abilities can be honed, allowing them to evaluate the tools themselves, and the contexts in which those tools are best applied; in other words, students need to know not just 'how' to use the tools, but also 'when and why' (Bowker 2015: 95). But the idea that the conceptual and the procedural can be easily divorced sits less comfortably in situated cognition approaches, and the default description of the procedural as the lesser member of the dyad certainly seems less tenable than it once was.[21] If anything, more recent approaches are not binary, integrating as they do an affective dimension, as in Alcina et al. (2007), where didactic objectives are divided into the cognitive, procedural and attitudinal.[22] Critical reflection now also extends beyond the 'artefactual' to the economic and the political, in cases where commentators encourage students to reflect on vested interests in the translation industry, on how translation technologies might be implicated in the marginalization or exploitation of translators, and how such tendencies might be countered (e.g. Kenny and Doherty 2014; Moorkens 2017, 2018; O'Hagan 2017; Kenny 2018b; Vieira 2018).

Critical approaches to translation technology become all the more important in the light of technological change. As machine learning gains momentum, and anxiety spreads about technological unemployment,[23] translation educators have to engage with pressing issues, such as how we can prepare a new generation of translators for a career in which artificial intelligence (AI), and especially deep learning, may play an important part (Massey and Ehrensberger-Dow 2017; Kenny 2018a). Curricula have to be updated to integrate technologies such as neural MT, which presents particular challenges, given its opacity (Burrell 2016; Kenny 2018c). Ethical issues come even more to the fore as the provenance and ownership of data (Moorkens and Lewis this volume) become particularly contentious, and translation students and practitioners have to remain alert to the possibility of AI bias in MT (Prates et al. 2018).

The increased uptake of MT in industry means that programmes in which the technology had previously been neglected are now making moves to integrate it into their teaching, and a growing number of studies provide models for how this can be done: alongside seminal work by O'Brien (2002), we note here more recent contributions by Flanagan and Christensen (2014), Koponen (2015) and Guerberof Arenas and Moorkens (2019). But while in the past there was a tendency for authors to motivate their work by evoking deficits in translator training, 'gaps' that needed to be filled in order to meet industry demands—a tendency that was much criticized by Pym (2011)—contemporary authors are keen to point out that educational programmes, even ones that keep a close eye on evolving markets, are not 'purely in the service of industry stakeholders' (Mellinger 2017: 281), and researchers such as Sakamoto et al. (2017) remind us that knowledge gaps can appear on the industry side too. There is also an appreciation in some quarters that the uncertainties that arise in contexts where activities are being 'redefined' may be fruitfully addressed through 'expansive learning', in which '[t]he design of the new activity and the acquisition of the knowledge and skills it requires are increasingly intertwined' (Engeström and Sannino 2010: 3), even to the point where they merge (ibid.). In other words, what needs to be learned cannot be known fully (by managers in the language industry or anyone else) in advance of the actual learning. In such contexts learners might be best served by industry and academia cooperating as equal partners, and some recent innovation in training in translation technology has proceeded precisely on this basis (Doherty and Kenny 2014).

This is not to say that there are no deficits in technology-related translator training. Li (2018), for example, observes that ninety nine master's programmes in translation and interpreting in China (or just over 44% of the 224 respondents to a wide-ranging questionnaire) do not offer translation technology at all, in most cases because the universities in question do not have appropriate staff.

Conclusion

From a niche activity in the 1980s and early 1990s, training in translation technology has grown to become a staple of academic translator training programmes in many parts of the world, and is largely motivated by a desire to improve students' employability. It has evolved with the technologies themselves, but also with the general shift from transmissionist to constructivist approaches to education, and has found a comfortable epistemological basis in situated and embodied cognition, thus sharing an affinity with workplace-based research. Commentators have embraced the need to restructure the field and to re-conceptualize translation itself in the light of a constantly evolving sociotechnical environment. At the time of writing, the main challenge we face relates to the integration of machine learning into translator training. The benefits of doing so will be felt not just in students' ability to function in the translation profession, but also in their growth as citizens.

Related topics

12.Technological advances in audiovisual translation

13. Technology, technical translation and localization

14. Technology and game localization: translation behind the screens

20. Post-editing of Machine Translation

21. Translation technology evaluation research

22. Translation workplace-based research

23. Translation technology research and Human Computer Interaction

26. Machine Translation: From RBMT and SMT to NMT

27. Quality

30. Copyright and the reuse of translation as data

Further Reading

Bowker, L. (2015) 'Computer-Aided Translation: translator training', S. Chan (ed.) *The Routledge Encyclopedia of Translation Technology*, London & New York: Routledge, 88-104.

This chapter motivates the inclusion of CAT tools and MT on translator training programmes and discusses the main issues in syllabus design in the area, including contents and sequencing, teaching and learning approaches, the development of critical thinking, and the allocation of resources.

Massey, G. and M. Ehrensberger-Dow (2017). 'Machine learning: Implications for translator education', *Lebende Sprachen* 62(2): 300-312.

This journal article looks to the future and outlines possible approaches to translator education in the context of advances in artificial intelligence, deep learning and neural MT in particular.

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Notes

[1] See, for example, arguments summed up in Kenny (1999:65-66) and Bowker (2015: 89-90).

[2] On the broad distinction between translator training and translator education, see Bernardini (2004).
[3] Most commentators would include the following under 'computer-aided translation' tools: translation memory tools—with their associated quality assurance and text analysis tools—and terminology management tools.
[4] Probably the first mention of the ALPS Translation Support System being used in academia relates to its deployment in Computer-Aided Language Learning (Corness 1986).
[5] Another early intervention in this field is that of L'Homme (1999).
[6] The University of Limerick's now superseded MSc in Multilingual Computing and Localisation, founded in 1997, was billed in 2015 as the first and the longest running postgraduate localization education programme in the world (http://www.localisation.ie/education/, last access July 31, 2017).
[7] See, for example, Freigang (2001). The MA in Translation Studies at Dublin City University, founded in 1992, had also begun offering a dedicated module in software localization by 1997, alongside its already established module in translation technology. By 2000, the Monterey Institute of International Studies, California and Kent State University in Ohio were also offering training in localization and project management to language and translation students (Esselink 2000:10).
[8] Somers (2001: 25) observes that a small number of papers that had appeared in the 1980s on the subject of machine translation and teaching were 'rather general in nature'.
[9] Language Engineering for Translators' Curricula. See http://www.iai-sb.com/forschung/content/view/37/50/ and http://www.iai-sb.com/docs/D22.pdf [last access July 31, 2017].
[10] https://www.leeds.ac.uk/arts/info/125053/centrefortranslationstudies/1807/researchandinnovation/5 [last access July 31, 2017]
[11] https://www.leeds.ac.uk/arts/info/125053/centrefortranslationstudies/1807/researchandinnovation/7 [last access July 31, 2017]
[12] https://www.leeds.ac.uk/arts/info/125053/centrefortranslationstudies/1807/researchandinnovation/6 [last access July 31, 2017]
[13] http://mellange.eila.jussieu.fr/index.en.shtml [last access July 31, 2017]
[14] www.certt.ca [last access January 31, 2019]
[15] http://linguistech.ca [last access January 31, 2019]
[16] https://ec.europa.eu/info/education/european-masters-translation-emt/european-masters-translation-emt-explaineden#documents [last access July 31, 2017]
[17] The importance of the involvement of the European Union in initiatives to support translation, translation technology and translator training cannot be underestimated. No doubt much of this involvement serves the political interests of the Union, which is concerned with protecting institutional multilingualism at the same time as controlling the associated costs, and for whom youth unemployment and migration present major challenges. The maintenance of a healthy language industry, the prioritization of employability as an educational outcome (in the Bologna process and initiatives such as the EMT network), and the control of translation costs through increased technologization, all serve to meet these challenges.
[18] http://www.ressources.univ-rennes2.fr/service-relations-internationales/optimale/ [last access July 31, 2017]
[19] http://www.instb.eu [last access January 31, 2019]
[20] Note that there is no consistency between commentators in the terminology used to describe what I call here 'procedural' and 'conceptual' knowledge.
[21] Note also that in other fields, for example mathematics education, there is evidence that conceptual and procedural knowledge support each other, and grow iteratively (Rittle-Johnson and Scheider 2015). In the absence of relevant research in the acquisition of translation technology competence, we might hypothesize that conceptual and procedural knowledge are also mutually reinforcing in our field.
[22] The affective dimension is also prevalent in work concerned with technology acceptance. See, for example, Koskinen and Ruokonen (2017).
[23] Assertions about the likely automation of even non-routine, cognitive jobs are now legion. Most are based on an analysis conducted in 2013 and published as Frey and Osborne (2017). Surowiecki (2017) provides a sceptical response.