Enhancing Instrumental Competence in Translator Training in a Higher Education Context: A Task-Based Approach

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Abstract—**This study aims to design a task-based e-Course for teaching computer-aided translation technology in a higher education context. It also investigates the impact of the e-Course on enhancing the instrumental competence of trainees, as reflected from their use of translation products. This study employs mixed qualitative and quantitative methods using descriptive statistics, pre-post paired sample tests, and an analysis of the translation process. Results of the paired-sample tests showed a noticeable increase in the scores of trainees. The difference in means between the pre and post-tests is statistically significant at P < 0.05. The descriptive statistics of errors have also shown that translation errors decreased dramatically after completing the e-Course. Analysis of the translation process indicated that trainees developed a noticeable mastery over translation competence when employing various CAT tools in the translation process. The study recommends that translator training in a higher education context in this age of globalization and localisation should familiarise trainees with the technical aspects of the industry and align with the industry's needs and specifications. In this sense, this study culminates in the design of a learning prototype for the teaching of various desktop and cloud-based computer-aided translation tools and not only those used by big companies in a blended, hybrid or fully online environment.**

Index Terms—**translation, competence, instrumental, training, computer-aided translation (CAT)**

I. INTRODUCTION

Curriculum development for translator training in the Arab World is in many ways largely isolated from the demands of the translation and language industry. The focus is often more on linguistic rather than on professional competence and employability. Training programmes at tertiary institutions commonly overlook key sub-competences of trainees including psycho-physiological and instrumental sub-competences. In some training scenarios, trainees graduate with no experience in using the computer-assisted translation tools (CAT) they will use in their future careers. It is therefore incumbent upon universities to review and enhance the quality of translation training programmes. Translator training in the post-COVID-19 era should adopt new approaches to training (i.e., teaching and learning), and assessment. The volatility, uncertainty, complexity and ambiguity in today's world (Bennis & Nanus, 1985) have increased the adoption of increasingly secure and reliable digital platforms by tertiary institutions around the world. To adapt to the reality and stay abreast to the demands of the post-COVID-19 market, instructional designers are more than ever required to adopt innovative strategies in the design of curricula, assessment methods, and the delivery of content. Translator training institutions are no exception (Mohammed, 2022). Translator education should ideally focus on the academic qualifications and employability of student translators by focusing on the demands of the translation industry. This is not possible if the training does not consider the digitisation of the translation process. Translator training institutions are therefore in dire need of courses that more specifically assist their trainees with developing instrumental competence and enabling them to translate various texts and genres using the latest technology. Student translators should be trained to use technology that enables them to carry out various translation and interpretation activities including dubbing, subtitling and software localisation. Familiarity with machine translation systems, translation memories, localisation, and computer-assisted interpreting tools, among others is thus required. There is sufficient evidence that the lockdown measures imposed by governments across the world during the COVID-19 pandemic demonstrated the need for digitisation of the language and translation industry: translators lacking sufficient technological skills could not secure employment and could not operate as freelancers.

The training of translators still largely lacks e-Courses that sufficiently meet the shifting demands of the industry. A cursory look at the Massive Open Online Courses (MOOCs) offered via various platforms, such as Coursera, shows that translation courses constitute a tiny fraction of language courses. This study, therefore, aims to design a fully online course that incorporates various aspects of instrumental competence in translation studies, and adopts a pedagogical

approach that enhances active and meaningful engagement. Active learning strategies which employ task-based projects (Willis, 1998) enhance the translation competence of trainees, boost their motivation and engagement, and familiarise them with problems they are likely to encounter in a professional setting. Using real or simulated tasks and projects, student translators learn how to use these tools, while simultaneously learning how to translate various texts. The e-Course also familiarises trainees with editing and post-editing tools to help assess the translation quality of automated systems (i.e., post-edited machine translations) as well as the translations of their peers. Training must go beyond traditional translation tasks and extend to common tasks in high demand, including the translation of video and audio content, and the translation of e-learning industry content (e.g., MOOCs, crowdsourcing of YouTube videos, postediting machine translation, localisation projects, etc.).

II. RESEARCH OBJECTIVES AND QUESTIONS

This study aims to design an online course for teaching computer-aided translation tools to translation trainees. The course adopts a task-based approach to training that takes into consideration the digitisation of the translation process, as well as the requirements and demands of the translation and language industry. This study also aims to determine the extent to which the proposed e-Course enhances the translation competence of participants. It attempts to answer the following questions:

1. What is the impact of the e-Course on the trainees' achievements?
2. To what extent does the e-Course improve the quality of the trainees' translations?
3. To what extent does the translation process reflect progress in the trainees' translation competence in general, and instrumental competence in particular?

To answer the first question, null and alternative hypotheses are formulated as follows:

H0: There is no difference in the mean scores of pre-test and post-test.
H1: There is a difference in the mean scores of pre-test and post-test.

III. LITERATURE REVIEW

A. Translation Studies in the Arab World

Although several translator training programmes have been introduced at Arab universities in the last several decades, generally they do not adequately fulfil the needs of the local and global markets (Al-Batineh & Bilali, 2017). Undergraduate programmes in translation studies are offered as part of language programmes at many Arab universities. These programmes have been particularly "marginalized in the syllabi of English departments all over the Arab World" (Ghazala, 2004, p.215). Several studies investigated translation programmes at Egyptian, Moroccan, Yemeni, Saudi and Palestinian universities (Al Aqad, 2017; Alaoui, 2008; Al-Mubarak, 2017; Al-Sohbani & Muthanna, 2013; Gabr, 2002, 2007; Mohammed, 2020). These studies share the concerns that translation programmes at Arab universities encounter the same basic problems, including the arbitrary nature of training materials and approaches. Materials are often chosen at the discretion of instructors, and often not based on scientific or market-related criteria (Gabr, 2002).

In a 2007 study by Gamal, the status quo of audio-visual translation and the crisis of the translation industry in the Arab World were investigated (Gamal, 2007). While the study acknowledged that individuals, organisations, and governments have made significant efforts to improve the situation, those efforts and policies have not fully rectified the situation. In another study, the state of machine translation (MT) in the Arab world in general and Saudi Arabia, in particular, was examined (Almutawa & Izwaini, 2015). Despite the significance of MT, Saudi universities and research institutes have made scant efforts to advance machine translation research. A sizeable number of organisations in Saudi Arabia are also averse to implementing machine translation systems (Almutawa & Izwaini, 2015).

B. Translation Competence

Although the goal of most translation programmes at Arab universities is to enhance the translation competence of student translators, at the time of this study, there were no empirical studies that adopted a holistic approach to enhancing translation competence. Some studies examined the level of bilingual and bicultural competence among postgraduate translator trainees at the American University of Sharjah and the University of Sharjah in the United Arab Emirates, as well as among Iraqi speakers of English as a foreign language (EFL), and Jordanian student translators (Abbadi & Belal, 2014; Al-Ghazalli & Layth, 2019; Bahumaid, 2010). These studies agree that while EFL and student translators demonstrate adequate linguistic competence, their cultural competence is not always equally developed. The above studies have also more generally overlooked translator competence in other dimensions. More empirical research is needed to identify the issues that impede trainees' performance at the lexico-grammatical, cultural, psycho-physiological, and strategic levels.

Other studies were conducted to assess the attitudes of trainees towards the teaching of computer-aided translation and courses in machine translation in the Saudi context (Alkhatnai, 2017; Almutawa & Izwaini, 2015; Alotaibi, 2017). The attitudes of student translators towards the use of CAT tools were also examined (Al-Jarf, 2017; Bundgaard, 2017; Çetiner, 2018; Dillon & Fraser, 2006; Mahdy et al., 2020). These studies showed that technology-enhanced instruction in the translation classroom has not only enhanced translation skills but has also changed student attitudes towards

translation as a discipline. All these studies reported positive attitudes towards the use of CAT tools, but also some problems related to affordability, connectivity, digital infrastructure, and lack of training related to these tools. Additionally, the attitudes of trainees towards the various components of translation competence were explored in a recent empirical study (Mohammed, 2020). Trainees from two Yemeni universities indicated that the instrumental and the psycho-physiological components of translation were not sufficiently integrated into the syllabi of the two universities; the same might be applicable to the translation education at other Arab universities.

C. Learning Designs and Pedagogical Innovations

The design of resources for teaching the instrumental and psycho-physiological aspects of translation competence is under-researched. Beaven et al. (2013), for instance, reported on a MOOC about open translation tools and practices offered in 2012 by the Department of Languages at the Open University, UK (OUUK). The MOOC discussed the use of CAT tools and paid special attention to subtitling and crowdsourcing. The study was focused on the translation of open educational resources (OER); crowdsourcing is undoubtedly a solution to make these resources available in other languages. A more recent study (Mohammed, 2021), explored how a blended course in Arabic-English translation in which CAT tools were introduced impacted the achievement of student translators. Although the study focused mainly on self-, peer- and instructor- formative assessments, the findings indicated that the use of such tools improved the achievement of trainees. The course was delivered via the Canvas Learning Management System (LMS) and included many real-world projects that were completed by the trainees over three months.

Despite the pressing need for a student-centred training approach, few studies have focused on pedagogic innovations and student learning in translation training in tertiary education contexts. A task-based approach was, for instance, investigated in the context of business translation (Al-Sowaidi, 2021; Li, 2013; Zheng, 2017). This approach was also used in the analysis of translation errors among Saudi students (Alenezi, 2020; Alkhatnai, 2017). Another study investigated a project-based approach in translator training in an Indonesian-English translation class (Apandi & Afiah, 2019). Similarly, in Herget's 2020 study, project-based training was adopted to train student translators to use a cloud-based CAT software called *Memsource* (Herget, 2020). More recently, the same approach was used to explore the translation processes such as pauses, focus, revision, and etcetera (Mohammed, 2022).

IV. THEORETICAL AND CONCEPTUAL FRAMEWORK

This study is based on a theoretical framework that combines pedagogical approaches such as task-based learning and instruction, and translation competence models. Several translator training programmes are built around one of several key models of translation competence, defined by the PACTE research group as "the underlying system[s] of knowledge, abilities and attitudes required to be able to translate" (Beeby et al., 2003, p.43). The PACTE group implements a model for translation competence that consists of six components, namely: bilingual competence, extra-linguistic competence, instrumental-professional sub-competence, psycho-physiological competence, transfer competence, and strategic competence. Another model of translation competence was developed by the European Master's in Translation (EMT) expert group. EMT was established by the European Commission's Directorate General for Translation to improve translator training by establishing a European standard for a master's degree in translation. The model also consists of six competences: translation service provision competence, language competence, intercultural competence, information mining competence, thematic competence, and technological competence.

Both models acknowledge the role of technology in translator and interpreter education. Hence, special attention should be paid to the technical and instrumental competences, which constitute a vital component of overall translation competence. The PACTE research group defines instrumental competence as "predominantly procedural knowledge related to the use of documentation, resources and information, and communication technologies applied to translation" (Beeby et al., 2009, p.208). Instrumental and technical competence not only deals with the development of common computer-aided translation tools used by translation firms, but may be expanded to include the following:

1. Technological competence is concerned with, "integrating software to help in translation, correction and research, adapting existing tools and becoming familiar with new ones, producing translations in various formats for different media and, finally, knowing the possibilities and limitations of machine translation" (EMT expert group, 2009, p.7).

2. Thematic competence, is "knowing how to search for appropriate information to gain a better grasp of the thematic aspects of a document" (EMT expert group, 2009, p.7).

3. Information mining competence, "includes identifying information and documentation requirements, developing strategies for research, extracting and processing task-relevant information, developing evaluation criteria, using tools and search engines effectively and archiving information" (EMT expert group, 2009, p.6).

These aspects of translation competence are still largely marginalised in the curricula of translation programmes in the Arab world and even globally. Curriculum development for translator training must adopt a trainee-oriented approach and involve trainees in real-world or simulated projects to equip them with the necessary facets of instrumental competence. Task-based training is beneficial for enhancing instrumental and technical competence, and translation competence in general. The approach emphasises the selection of appropriate texts which help develop specific translation sub-competences. Li has adapted Willis' cycle of task-based instruction, (Willis, 1996) as illustrated in Figure 1.
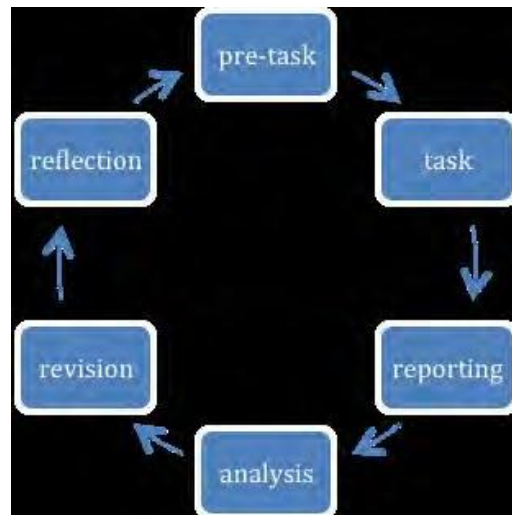
Figure 1: Cycle of Task-Based Teaching in Translation (Li, 2013).

According to the model in Figure 1, a task-based approach to translation training includes a six-stage cycle. Prior to the task, trainees should familiarise themselves with the terms and conditions of the translation work (developing translation knowledge competence); consider useful resources (instrumental competence); read extensively in both the target language (TL) and source language (SL) to gain a thorough understanding of the subject (bilingual competence); identify pertinent terminologies (extra-linguistic competence); and decide on the translation strategies and technique(s) to use (strategic competence). During the exercises, trainees work in pairs or groups on assigned tasks (bilingual, strategic, and psycho-physiological competences); look for relevant information and resources (instrumental and extra-linguistics competences); and communicate with the client to ascertain relevant details (competence of translation knowledge). Upon completion of a task, trainees report and reflect on their translation processes, summarise any translation problems and solutions, and collaborate to ensure consistency of translation (developing translation knowledge competence and strategic competence). During the analysis phase, the instructor establishes a task's intended learning objectives and discusses various aspects of the task. Trainees and the instructor together conduct a thorough analysis of several translations (developing competence in translation knowledge). During revision, the instructor assists trainees by revising and editing the assignment and may offer suggestions for improvement. Trainees revise and edit their translations following any feedback (translation knowledge competence), and then evaluate, finalise, and produce the translation. During the final stage of reflection, the instructor reviews the entire translation process from a pedagogical standpoint and may make notes for future instruction. The trainees might reflect on project management, the execution of translation plans, the quality of their work, their communication with the client, as well as on any translation problems they encountered and the strategies they employed.

V. THE DESIGNED LEARNING PROTOTYPE

This section deals with the design of an interactive online system for teaching CAT tools used in the management of translation processes such as pretransition, translation, and editing and revising human and machine-based translations for quality assurance. This e-platform is designed using Moodle (LMS). The course is divided into ten chronological units which cover the various trends and technologies used in the translation, localisation, and language industries today. The modules of the e-Course are provided in Table 1.

TABLE 1
OVERVIEW OF THE MODULES OF THE LEARNING PROTOTYPE

Modules	Content	CATs and tasks
Module 1	Overview of translation and language industry	
Module 2	Internet basics for translators	Basic search, Boolean operators search, online dictionaries, databases, Romanisation tools, etc.
Module 3	CAT- overview	Pre-translation assignment (scanned document, optical character recognition (OPC), Voice recognition technology (VRT), text to speech (TTS))
Module 4	Corpus linguistics and translation practice	Creating monolingual, comparable and parallel corpora using cloud-based and desktop tools covered in the module.
Module 5	Machine translation	Machine translation and post-edited machine translation (PEMC)
Module 6	Translation memories	Search for available translation memories and convert a translation job to a translation memory.
Module 7	Desktop CAT tools	SDL Trados Studio, memoQ, Wordfast (Classic & Pro), Déjà Vu, Fluency Translation Suite 2013
Module 8	Cloud-based translation tools	Memsource, Wordfast Anywhere, Smartcat, MateCat, Wordbee
Module 9	Introducing Audio-visual translation	Lokalise, Transifex, Crowdin
Module 10	Technology and interpreting practice	interpreterQ (interpreterQ Media Player), inTrain, Zoom's interpretation features

To familiarise trainees with as many common tools as possible, the CAT software covered in the e-Course was selected based on the G2 Grid® for the top Computer-Assisted Translation Software products (https://www.g2.com). G2 rates products and sellers based on user reviews and data gathered from online sources and social networks.

To ensure effective system-user interaction, and to provide support for the trainees in the course, several materials for self-training were also prepared. Some of these materials include software tutorials; texts for optical character recognition (OCR); parsed and aligned texts; translation memories; texts for human translation; texts for post-editing, texts for editing and revising (PEMTs and human-translated documents); collaborative interactive tasks; quizzes; and simulated and real-world projects. The online platform is user-friendly, available 24/7 using a web browser, and manages the entire learning process. Moreover, stakeholders in translation training do not need to manually update the sitemaps or save data into an open-source relational database management system (RDBMS) such as MySQL. External links can be easily created via LMS. All tasks and assignments are submitted via the system to facilitate self-, peer-, and teacher-assessment.

VI. METHODS

This study used both quantitative and qualitative methods. The former was used to investigate the impact of the syllabus and task-based approach on the scores and achievements of trainees. For this purpose, a paired-sample t-test and descriptive statistics of translation errors across tasks were both used. The process of translation was analysed and monitored by using the keylogging software *Inputlog*. The latter method was used to gain insight into the role of e-Course in enhancing translation competence in general, and instrumental and technical sub-competences in particular. The module in which this research took place was offered in the first semester of a Bachelor of Arts programme over four months (September 2019 to December 2019) by the Department of English at Taiz University in Yemen during the academic year 2019-2020.

A. Instrumentation

To answer the first research question, "What is the impact of task-based training on trainees' translation competence?", a quasi-experimental investigation design with a pre- and post-test given to the same group was conducted at the beginning and end of the course. The group consisted of sixteen trainees.

B. Procedure

Prior to the investigation, the sixteen trainees were asked to complete a pre-test in Arabic-English translation. The translations produced by the trainees were assessed by a jury of three specialists based on a rubric. Throughout the course, trainees were also tasked with five translations to complete using the CAT tools covered in the course. From this, a parallel corpus of the trainees' errors was created. At the end of the course, the trainees took a post-test in Arabic-English translation, which was assessed by the same jury of examiners using a detailed rubric.

VII. DATA ANALYSIS

A. Pre-Test vs. Post-Test

The pre-test was conducted at the beginning of the course before trainees were introduced to any CAT tools. They were asked to translate a text of 750 words from Arabic into English. Table 2 shows a summary of the pre-test results.

TABLE 2
DESCRIPTIVE STATISTICS FOR THE PRE-TEST

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest	16	56.00	80.00	68.7500	6.74784
Valid N (listwise)	16				

As Table 2 shows, the minimum score on the pre-test was 56 and the maximum score was 80. The average score of the sixteen trainees on the test was 68.75. The post-test was conducted after the trainees covered a considerable number of CAT tools. They were also given a lengthier text to translate into English. Although it was the same text-type of the pre-test, it was more challenging. Table 3 shows a summary of the post-test results.

TABLE 3
DESCRIPTIVE STATISTICS FOR THE POST-TEST

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Posttest	16	65.00	90.00	77.5000	8.18128
Valid N (listwise)	16				

Table 3 indicates that the minimum score in the post-test was 65 and the maximum score was 90. The average score was 77.50.

Some differences in the results of the pre- and post-tests were noticeable; the mean on the post-test increased by nine points. However, statistical methods were still needed to determine whether the difference in means was a result of the training, or a matter of coincidence. As such, it was necessary to test for possible assumptions to determine a suitable statistical analysis. To conduct a paired sample t-test, the two groups must be paired. Additionally, the difference between the two related groups should not exhibit any significant outliers, and any difference in pairs must follow a normal distribution. IBM's Statistical Package for the Social Sciences (SPSS) was used to test these assumptions. The data showed that skewness is -0.229415 and kurtosis is -0.186142. One popular guideline for evaluating skewness and kurtosis when testing for normality is that skewness does not exceed .8 and the value of kurtosis does not exceed 2. In addition, the data are normally distributed if the significant value is greater than the level of significant .05. Table 3 shows the results of the Kolmogorov-Smirnov and Shapiro-Wilk tests by using SPSS.

TABLE 4
TESTS OF NORMALITY

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Difference	.160	16	.200[*]	.968	16	.805

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

As the data in Table 4 shows, the result of the normality test was .805, and thus greater than the significant value of .05. Therefore, the data follows a normal dispersion. Outliers can be graphically represented as a quantile-quantile (QQ) plot, as shown in Figure 2.
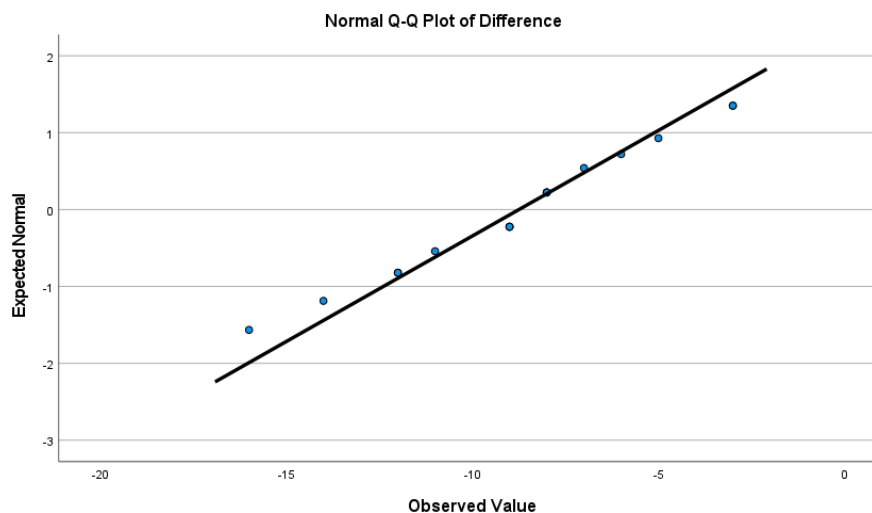

Figure 2 Normal QQ Plot of Difference

The graph indicates that all the points fall approximately along the (45-degree) reference line, for each group and thus the normality of the data can be assumed.

Having checked the various assumptions, the paired samples test was conducted using SPSS. The results appear in Tables 5 and 6 below.

TABLE 5
PAIRED SAMPLES STATISTICS

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Posttest	77.5000	16	8.18128	2.04532
	Pretest	68.7500	16	6.74784	1.68696

TABLE 6
PAIRED SAMPLES TEST

Paired Samples Test

		Paired Differences					t	df	Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Pair 1	Posttest - Pretest	8.75000	3.64234	.91059	6.80913	10.69087	9.609	15	<,001	<,001

As Table 6 indicates, the *t* statistic is 9.609, and the *p*-value (sig. (2-tailed)) is 0.001. Therefore, the null hypothesis (no difference between the means of the two tests) can be rejected with 95% confidence. Thus, there is evidence that the teaching intervention enhanced the translation competence of trainees. The 'lower' and 'upper' limits of the 95% confidence indicate with 95% certainty that the population mean difference between the *pre* and *post*-scores is between 1.41 and 3.37 marks, as shown in Table 7.

TABLE 7
PAIRED SAMPLES EFFECT SIZES

Paired Samples Effect Sizes

			Standardizer^a	Point Estimate	95% Confidence Interval	
					Lower	Upper
Pair 1	Posttest - Pretest	Cohen's d	3.64234	2.402	1.410	3.374
		Hedges' correction	3.83806	2.280	1.338	3.202

a. The denominator used in estimating the effect sizes.
Cohen's d uses the sample standard deviation of the mean difference.
Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

This difference in scores is not only statistically significant but is also practically important.

B. Translation Errors

A corpus of errors was compiled based on the texts translated by trainees. Related to this, this study attempts to provide a general taxonomy of errors, although a comprehensive one is beyond the current scope. The aim in this study is to determine whether the approach adopted in the study contributed to the decrease in translation errors, which may be an indication of the improvement in translation competence. Errors were classified into four categories: grammatical, lexical, textual, and others, as shown in Figure 3.
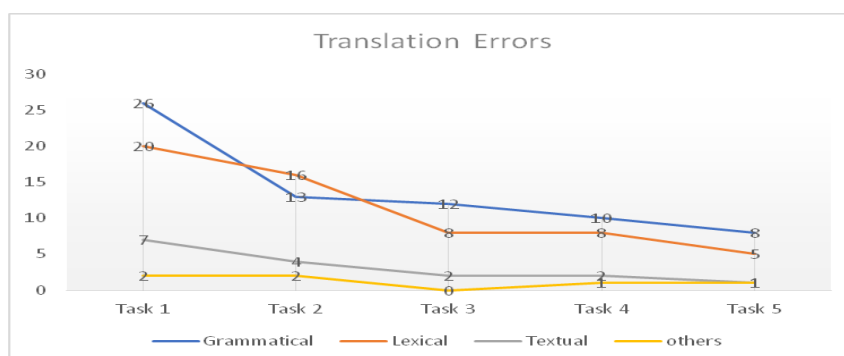

Figure 3 Translation Errors Across Tasks

As Figure 3 shows, the number of errors was the highest in the first task, and decreased dramatically in the following tasks, although the texts were more challenging. The fewest errors were found in the fifth task.

C. Translation Process and Computer Observation

The end product is the culmination of various pauses, revisions, focuses, and other processes during translation. For the purpose of this study, *Inputlog*, a software for process-oriented language research, was used. *Inputlog* provided a detailed account of the processes involved in a translation task of ten sentences, as shown in Table 8.

TABLE 8
PROCESSES INVOLVED IN THE TRANSLATION OF PROJECT 1

Overview	
Total Process Time	00:37:50
Total Pause Time	00:21:47
Total Active Writing Time	00:16:02
Total Number of Pauses	1679
Total Process Time (s)	2270.141
Total Pause Time (s)	1307.227
Total Active Writing Time (s)	962.914
Proportion of Pause Time	57.584 %
Total Keystrokes incl. Inserted and Replaced Characters in Main Document	1327
Characters in Final Text of This Session	706
Total Words in Main Document	133
Total Paragraphs in Main Document	9

Table 8 shows that the translation of the texts was completed in 00:37:50 (2270.141). The total number of keystrokes, including inserted and replaced characters in the main document, was 1327. The characters in the final text, including spaces, are 706. The differences between process and product in terms of both time and characters are a clear indication that a trainee translator spends a lot of time editing and revising the first draft. The translation process included 1679 pauses. These pauses are located within words, before words, before sentences, and before and after paragraphs, as Figure 4 shows.
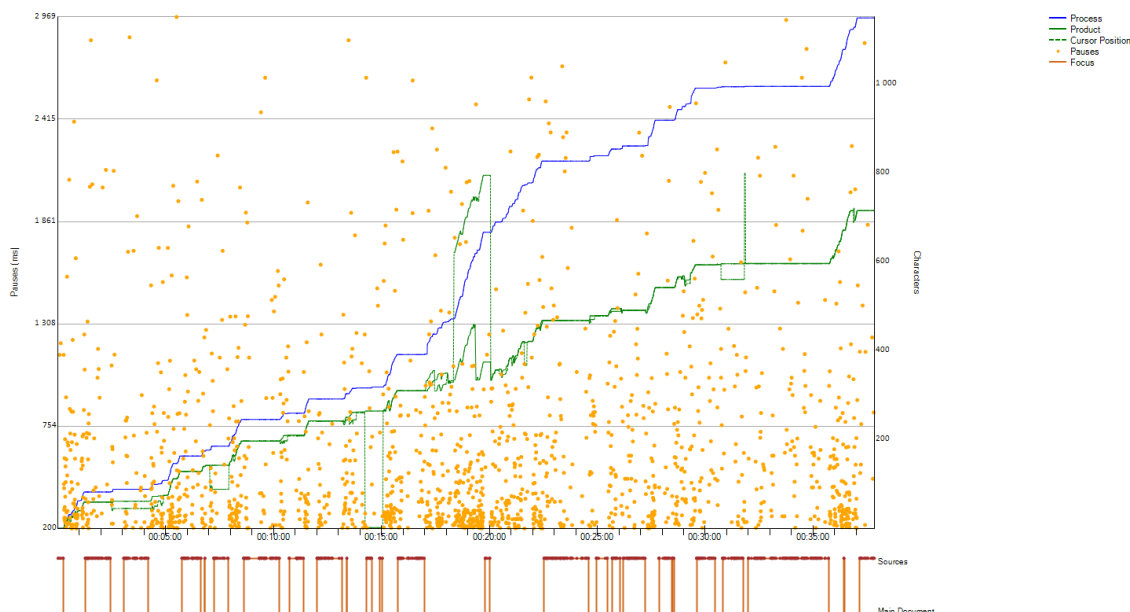

Figure 4 Pauses During the Translation Task

The pauses indicate problems involved in the translation of sentences, the strategies used to solve these problems, the edits, and the various CAT tools used during translation. The Focus panel in Figure 4 indicates that various CAT tools, which were covered in the e-Course, were employed, including: Memsource, a parallel corpus (Reverso), the web as corpus, the use of e-dictionaries, Wikipedia, and Google images, among others, as shown in Table 9.

TABLE 9
CAT TOOLS USED DURING THE TRANSLATION OF TASK 1

Window Title	Total Time (s)	Total Keystrokes
القديم بالانجليزية - Google Search - Google Chrome	32.006	18
Google Chrome - ترجمة و معنى قديد بالإنجليزي في قاموس المعاني. قاموس عربي انجليزي مصطلحات صفحة 1	61.087	21
jerked meat - Google Search - Google Chrome	17.479	0
Untitled - Google Chrome	1.328	0
قديد - Translation into English - examples Arabic | Reverso Context - Google Chrome	27.563	0
Google Chrome - ترجمة و معنى منقوع بالإنجليزي في قاموس المعاني. قاموس عربي انجليزي مصطلحات صفحة 1	53.979	19
ailments synonym - Google Search - Google Chrome	33.672	11
ما الفرق بين البلح والتمر - Google Search - Google Chrome	55.219	17
مقال | الفرق بين التمر والرطب بالصور - Google Chrome	71.265	0
المطر والغيث - Google Search - Google Chrome	33.422	30
موضوع - ما الفرق بين المطر والغيث - Google Chrome	56.703	2
Google Chrome - ترجمة و معنى الدابة بالإنجليزي في قاموس المعاني. قاموس عربي انجليزي مصطلحات صفحة 1	75.888	18
Google Chrome - ترجمة و معنى عمامة بالإنجليزي في قاموس المعاني. قاموس عربي انجليزي مصطلحات صفحة 1	29.716	10
Turban - Google Search - Google Chrome	3.984	0
Turban - Wikipedia - Google Chrome	42.313	0
Hejazi turban - Wikipedia - Google Chrome	64.425	13
Google Chrome - ترجمة و معنى عباءة بالإنجليزي في قاموس المعاني. قاموس عربي انجليزي مصطلحات صفحة 1	53.987	0
Abaya - Wikipedia - Google Chrome	22.197	5
جلباب رجالي - Google Search - Google Chrome	24.529	19
عباءة رجالية - Google Search - Google Chrome	46.297	7
Thawb - Wikipedia - Google Chrome	52.801	2
WebCorp: The Web as Corpus - Google Chrome	14.781	11
WebCorp: The Web as Corpus - Results - Google Chrome	121.156	0
تعريف و شرح و معنى صمم بالعربي في معاجم اللغة العربية معجم المعاني الجامع، المعجم الوسيط ،اللغة العربية المعاصر ،الرائد ،لسان العرب ،القاموس المحيط - معجم عربي عربي صفحة 1 - Google Chrome	10.094	6
تعريف و شرح و معنى العيس بالعربي في معاجم اللغة العربية معجم المعاني الجامع، المعجم الوسيط ،اللغة العربية المعاصر ،الرائد ،لسان العرب ،القاموس المحيط - معجم عربي عربي صفحة 1 - Google Chrome	29.906	0

The revision process typically involves many standard productions, deletions, and insertions in conjunction with consulting online translation resources. Table 10 below shows the data of these various processes.

TABLE 10
REVISION PROCESS IN TASK 1

Type	#Revisions	Edits	Duration	Length	Chars	Chars without space	Words
Normal Production	32	823	06:40.249	671	530	415	132
Deletion	71	663	01:04.885	718	444	0	92
Insertion	76	1383	06:47.562	782	616	0	142
Production + Revisions	179	2869	14:32.696	2171	1590	415	366
Total Processing Time			37:50.141				

VIII. DISCUSSION

This study examined the effect of using computer-assisted tools to enhance the translation competence of trainees, as measured by pre-, and post-tests. The findings of this study showed that the post-test scores of the group were

considerably higher than the pre-test ones. The results of this study are in line with Alenezi (2020); Al-Sowaidi (2021); and Mohammed et al. (2020) who found that technology is a valuable tool for enhancing the translation competence in general, and linguistic and instrumental competences in particular.

Regarding the second research question about the number of translation errors across tasks, this study revealed that using CAT tools led to a significant improvement in the performance of trainees, indicated by the steady decrease in errors as they proceeded with the e-Course. The accuracy, usability, readability, and compliance of the translated texts showed noticeable improvement. This result is consistent with the findings of Morin et al. (2017) whose study indicated that the use of standalone translation memory (TM) systems, speech recognition, and post-edited machine translation has contributed positively to student translation performance. This study's finding also aligns with that of Ovchinnikovaa (2020) who found that CAT platforms and machine translation (MT) systems enable users to detect errors and ensure a quick delivery of the final product; giving translators the opportunity to focus on transferring the content of source texts and pay closer attention to their textuality. Generally speaking, computer-assisted translation tools and machine translation have increased the productivity, consistency, and quality of translation work (Doherty, 2016).

Tracking the translation process revealed that trainees utilized the CAT tools they covered in the course. Among the tools are search engine optimization (SEO) operators, bilingual and monolingual dictionaries, corpora tools, the web as a corpus, terminology management systems, and local and universal translation memories. While the findings of this study contradict the results of Mahdy et al. (2020) who found that Yemeni professional translators are often averse to using CAT tools, they support results from empirical studies in the Arabic context such as Mohammed (2022). Investigation of the translation process using specialised software including eye tracking, keystroking, and screen recording illustrates the extent to which trainees have become technologically literate and developed.

As far as the training approach is concerned, the findings of this study showed that the simulated and real-life projects completed by the trainees not only raised their awareness of new CAT software, but also deepened their understanding of them. Completing the course as a series of tasks, or projects not only developed trainees' technological skills, but also their presentation, learning, communication, and market-related skills. Although this study does not investigate the attitudes of the student translators towards the e-Course, all the above skills are present during the translation process, as monitored by several computational tools. The various projects introduced in the e-Course were completed by the trainees themselves. The researcher, or instructor assumed the role of a facilitator only. During the various phases of the tasks, trainees gained a better understanding of the various phases of translation, from coordination and pre-translation, to the finalisation of the project and delivery to a client. This finding confirms the studies of Alkhatnai (2017) and Li (2013) who reported the rewarding benefits of a project-based approach in translator training.

IX. Conclusion

This study aimed at designing an e-Course for teaching computer-assisted translation tools in a tertiary education context. The use of CAT tools is already a widespread practice in the translation industry. Hence, the digitisation of translator education is beyond dispute. The e-Course in this study familiarised the trainees with various well-known desktop and cloud-based translation tools and software. The e-Course was designed and delivered via Moodle LMS. It adopted a task-based model for training, where trainees were required to complete simulated and real-world translation projects. The study employed mixed qualitative and quantitative methods. The results of the paired-sample tests showed a noticeable increase in the scores of the trainees. The differences in means between the pre- and post-tests were found to be statistically significant at $P < 0.05$. A parallel corpus for the trainees' errors from their five assigned projects was also compiled. The descriptive statistics of errors showed that translation errors decreased dramatically after the completion of the course.

Analysis of the translation process indicated that the trainees developed increased mastery over translation competence as they employed various CAT tools in the translation process. The pauses during the translation process indicated that trainees employed electronic dictionaries, CAT software, translation memories, available corpora and more. The process of translation underwent rigorous revision, as reflected in the numbers of standard productions, deletions, and insertions. The quality of the final product indicates that CAT tools enabled the trainees to produce a communicative target-reader-friendly text with a high degree of accuracy.

The findings of this study have some pedagogical implications. Translator training in a tertiary education context in the age of globalisation and localisation must familiarise trainees with the essentials of the industry. It should also be aligned with the needs and specifications of the language and translation industry. In this sense, this study culminates in the design of a learning prototype for various computer-aided translation tools (i.e., desktop, cloud-based) and not only those used by big companies.

Based on the findings of this study, it is recommended that translation technology be given more attention in the syllabi of Arab universities. However, the integration of key desktop and cloud software as well as ancillary tools into these syllabi may be insufficient. Innovative pedagogical approaches also need to be adopted in the delivery of such courses. Project-based learning, task-based models, and situated and discovery learning, among others, can be used effectively in the training of translators in the Arab world. The traditional transmissionism and teacher-centred approach

may fail to enhance the translation competence of would-be translators in all its dimensions. A transformational trainee-centred approach is a viable alternative.

Despite the importance of its findings, this study is not without limitations. This is the initial phase of an action-based research project, which is concerned with the design of a CAT e-Course. Future research could include the investigation of the attitudes of trainees, professional translators, trainers, and industry professionals towards the designed e-Course. Data collection tools could include both quantitative and qualitative methods such as retrospective interviews and questionnaires to further elicit students' views and attitudes towards the e-Course.

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