

UDC 37.091.33-027.22:004:81'322.4

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## **TEACHING MACHINE TRANSLATION TO THE STUDENTS MAJORING IN THE HUMANITIES**

**Abstract.** Problems of machine translation (MT) are currently the most topical vectors determining the development of translators' proficiency content, which is reflected in the diversity of approaches to improving the algorithms of knowledge applications in this field. We recognize the urgency of theoretical substantiation of the students' training quality (we mean the training of the future philologists and translators) in terms of using ICT, since their proficiency in the designated sphere might facilitate their natural and rapid adaptation to professional activity and competitiveness in the labour market. The analysis of professional literature showed the importance of using computer technology while training future translators in machine translation and proved that not all the reserves for its effective provision have been used. The urgency of the problem and lack of its proper development stipulated the purpose of the article – to analyse and develop educational tools that contribute to the formation of a system of knowledge and skills related to the use of modern computer technologies in the process of professional activity (on the material of the English, Chinese and Ukrainian languages). A spectrum of the MT programs classified based on human's involvement in the process of converting the original text into a target text (FAMT, HAMT, MAHT) has been represented in the article. The criteria (professional competency of the future translators in the field of the English-Ukrainian MT, professional competency of the future translators in the Chinese-Ukrainian MT), indicators (content-significant, procedural-technological and lexicographic search-oriented) and levels (high, sufficient, satisfactory, low) specifying the degree of students' proficiency (knowledge, skills and abilities) in using modern computer technology within the framework of profession-oriented activities have been elaborated. The proposed authors' teaching techniques included the use of the competence-oriented and context-based approaches to the educational process, the integration of traditional and new interactive methods/forms of learning, the combination of classroom and extra-class activities involving ICT. We see the prospects of our research in the further study of educational aspects of machine translation grounded on the latest developments in the fields of comparative linguistics and general theory of translation (theory of regular correspondences, methods of representing knowledge, optimizing and improving linguistic algorithms, in particular).

**Keywords:** computer technologies; machine translation; future translators; criteria; indicators.

## 1. INTRODUCTION

**The problem setting.** Problems of machine translation (MT) are currently the most topical vectors determining the development of translators' proficiency content, which is reflected in the diversity of approaches to improving the algorithms of knowledge applications in this field. The keen attention of specialists from various fields of knowledge to the above mentioned problem is explained, first and foremost, by the obvious advantages of working with systems of machine translation: high speed of translation, low cost, confidentiality, versatility, online work and translation of Internet pages content, uniformity of terminology, search systems queries, etc. It should be noted that the main advantage of MT for a wide range of users is its ability to convey the meaning of a received e-mail or the content of an Internet page (without an ideal translation). In this case, the system of machine translation, without any doubt, can become a reliable and effective assistant. Today, despite a significant accent on the study of the problems related to MT, there is a lack of useful electronic dictionaries containing the necessary vocabulary information and a clear terminology apparatus of sublanguage lexicons, which reduces the quality of the translation of lexical units. Another set of difficulties connected with machine translation is related to the need to improve formal grammars that are oriented towards translation, which will enable the optimization of the algorithms aimed at finding translated correspondences in a particular communicative situation that can be described within the framework of corresponding applied theories of knowledge representation. Finally, the new features of programming and computing also contribute to the improvement and further development of the theory and practice of translation.

**The analysis of recent studies and publications.** We should confirm the relevance of theoretical substantiation of the students' training quality (we mean the training of the future philologists and translators) in terms of using ICT, since their proficiency in the designated sphere might facilitate their natural and rapid adaptation to professional activity and competitiveness in the labour market. The domestic normative framework which regulates knowledge, skills and abilities necessary for entering a profession is based on the Law of Ukraine "On Higher Education" (2014), the Law of Ukraine "On the Basic Principles of the Information Society Development in Ukraine for 2007–2015" (2007), the Order "Strategy for the Development of Information Society in Ukraine" issued by the Cabinet of Ministers of Ukraine (2013), the main document of the European educational project on the standardization of translation-targeted education "EMT" ("European Master's in Translation") as well as the key standards "Qualification and certification of translators" in Ukraine (CTTY AIIY 001-2000).

Various aspects of the professional training of the future philologists and translators have become the subject of research for many domestic and foreign scientists. The general problems of training translators were considered by such scholars as: V. Karaban, T. Kyyak, I. Soiko, Ye. Tymchenko, O. Shabliy, J. Albrecht, H. G. Hönig, G. Jäger, F. Königs, A. Neubert, K. Reiß, P. Schmitt, R. Stolze and others. Scholars studied the pedagogical component of the future translator training in the framework of these aspects: the introduction of ICTs into Bachelor Courses intended for the future translators (O. Matsiuk, O. Rohulska, R. Tarasenko and others); theoretical and methodological principles of professional training of specialist translators (M. Morozov, S. Panov, O. Popova, Ya. Retsker, A. Fedorov, D. Ussov and others); component composition of translator's professional competence (M. Verbytska, N. Gavrylenko, T. Hanychova, V. Ignatenko, N. Zinukova, A. Monashenko, T. Pasichnyk, I. Simkova, O. Cherednichenko, L. Chernovatyi, F. Alves, F. Gasparia, R. Mackenzie and others); teaching and methodological support as well as the means of practical training of the

future translators (I. Aliksieieva, L. Visson, L. Latyshev, G. Miram, V. Provotorov, O. Rebriy and others).

The systemic analysis of professional literature, on the one hand, confirms the importance of using computer technology while training future translators in machine translation, and, on the other hand, proves that not all the reserves for its effective provision have been used: there are no comprehensive works on the problems regarding practical application of computer technologies in profession-oriented activities, which requires proper study and reflection in pedagogical research. We may state the following contradictions discovered in the process of scientific reflection: • between increasing demands from the public on translators' proficiency to use ICT and the real state of readiness demonstrated by university graduates to perform translation; • between the emergence of a large number of ICT tools for translation and interpretation and their inadequate implementation into the context of the traditional system of training translators; • between the dynamic development of the translation industry and the imperfection of the educational and methodological support for the development of the future translators' proficiency in using ICT, etc.

The urgency of the problem and lack of its proper development stipulated the **purpose** of the article – to analyse and develop educational tools that contribute to the formation of a system of knowledge and skills related to the use of modern computer technologies in professional activity (on the material of the English, Chinese and Ukrainian languages). The training of the future translators was grounded on the study of theoretical and practical aspects related to the use of computer technologies in professional activities, which allowed us to solve the following **tasks**: 1) to study the function mechanisms of the modern machine translation programs; 2) to determine the criteria and indicators for the formation of the future translators' knowledge and skills to use modern computer technologies in their job; 3) to elaborate a system of exercises which could contribute to the formation of the above mentioned knowledge and skills.

## 2. RESEARCH METHODS

Among *research methods*, we can single out these ones: both theoretical and practical analyses of pedagogical experience enabling the substantiation of the scientific and methodological support which could facilitate the formation of the future translators' system of knowledge and skills to use the modern computer technologies within their profession-oriented activity. The framework of the research presupposed also the use of *empirical* and *theoretical* methods: the linguistic and translation analysis of different authentic texts and target texts and the quantitative analysis. *The linguistic and translation analysis* of different authentic texts and target MT-texts enabled the assessment of the students' deep / superficial understanding of the original texts, their skills / abilities to identify and correct linguistic errors and flaws while analysing MT-texts. *The quantitative analysis* facilitated establishing an appropriate ratio of the outcomes within the pre-experimental and post-experimental stages of the above mentioned training.

## 3. THE RESULTS AND DISCUSSION

The practice of automated translation of texts belonging to different genres and styles is based on theoretical knowledge and practical skills, which are provided by the syllabi of the courses “Information Technology in Translation”, “Translation of Different Types of Discourse”, “Fundamentals of Scientific Research”.

The discipline “Problems of machine translation” is aimed at forming these competences:

- *general*: to be able to find and effectively use information from various sources that is necessary for solving problems; to be able to master new material and relate it to the known information in the field of computer technology; to possess a culture of thinking; to be able to analyse and generalize information, to set goals and find ways to achieve them;
- *professional*: to have skills to work with the computer as a means of obtaining, processing and managing information; to be able to work with traditional media and electronic databases; to be able to work with information in global computer networks; to be able to use electronic dictionaries and other electronic resources for solving linguistic problems.

Taking into consideration the above said, it is clear that the structure of each of the training modules must contain the original (authentic) text and its translated version based on the description of the sequence of translation operations for the construction of automatic translation algorithms, a terminology dictionary, including a brief explanation of the meaning of terms as well as applications with practical tasks for training in machine translation.

One of the determinants for the training targeted at the students of the humanities departments is the theoretical basis behind MT which includes, first of all, a clearly specified subject of learning and unambiguous translation terminology.

In the framework of the study, we understand *Machine Translation* as the process of translating some text from one natural language to another, which is implemented by a computer. At the same time, in order to make the above mentioned definition more understandable, we will complement it with the necessary explanations: during this process, the machine “obtains” the text (comprised of words), the verbal part of which is not accompanied by any additional instructions, and as the output we get a text in some other language, which is the translation of the input. We should note that the conversion of the input text (a source text) into the output one (target text) occurs without human’s assistance (sometimes some post-editing is presupposed). Furthermore, all practical systems, without exception, use the idea of translation correspondences, that is, they are based on the text-text model. The conception of translation modelling by means of translated correspondences is based, firstly, on the typology of language correspondences, and, secondly, on solving the problem of interaction of language levels in translation. It is necessary to dwell on the notion of *translation correspondences*, which can be interpreted as some generalized translation essence, referred, for example, to the unit of translation of a certain reference language; translation correspondence (conformity) is the unity within the two natural languages. As a unit of translation, translated correspondence can be a multi-level phenomenon, that is, it may cover different language levels [4], [5].

When dealing with the students of the humanities departments, the most difficult stage is the systematization of the linguistic difficulties of machine translation [1], [3] (problems of polysemantic language units, complex structures (idioms and phrases), structural differences of languages) during the processing of non-related languages. The practice of working with English, Chinese and Ukrainian showed that the MT of Chinese-Ukrainian or Ukrainian-Chinese versions of any genre causes the greatest difficulties. This is explained by the imperfection of the existing programs, and often by the need to involve other languages, e. g. English and / or Russian, in the translation process.

To choose a machine translation program and to evaluate its effectiveness is a big and difficult task. In this regard, we will specify some aspects concerning students’ training which could ensure the successful use of their knowledge in the process of their practical work.

Different types of electronic dictionaries are needed to translate texts belonging to different genres. Types of electronic dictionaries (formalized correspondences of a set of characters in working languages) as well as the rules for their structuring and functioning

within machine translation systems are specific. Each of the dictionaries covers mainly the functional and semantic fields of the linguistic units which relate to a certain style of communication. It should be noted that the more word-forms a system recognizes within a less volume of entries in the dictionary, the more perfect it is.

It should also be mentioned that when new machine translation software is released into the market, it would be useful for the user to obtain the information concerning the recommended list of electronic dictionaries on relevant topics, for working with specialized texts, in particular.

When choosing a software product, it is also important to take into account the goals pursued by the program. According to this criterion, modern machine translation programs are divided into three groups [6], [7], [8]:

1. FAMT (Fully-Automated Machine Translation) – fully automated machine translation tools. Such systems are still being developed, since the problems of automatic understanding, translation and synthesis of “live” texts have not yet been resolved, and this is unlikely to happen in the near future. Some types of the FAMT-programs are already available for “on quick” translation of oral speech, although their capabilities are still extremely limited.

2. HAMT (Human Assisted Machine Translation) – applications for automated machine translation of texts performed with a partial involvement of a person; and this group comprises the products “originated” from the TM systems (translation memory) and the MT systems (memory translation), which are based on other principles (statistical, phraseological) and provide complex solutions.

3. MAHT (Machine-Assisted Human Translation) – auxiliary tools for carrying out human translation using a computer. Today, the absolute majority of “electronic translators” and computer dictionaries (both software and online) comprise the category of the MAHT applications.

The other criterion for the correct choice of the program is the area of its application: commercial or intended for mass consumers. Fortunately, today’s technological innovations / products (due to the expansion of PC capabilities, high-quality scanners accessible for mass users, optical text recognition software, improvement of the Internet, etc.) are characterized by ease of the user interface, numerous support functions and multimedia capacities. Their electronic dictionaries are also optimized [5], [6].

All of the foregoing explains the increase of the investment into the field of automated translation – the development of very effective systems of machine translation, computer information reference sources and dictionaries (products of domestic and foreign companies Pragma, Google, “Bit”); a combination of MP systems with optical text recognition and spell checking systems; the creation of special MP facilities for working in the Internet, which enables the translation of texts on the servers of corresponding companies and online translation of Web-pages [9].

Among the commercial programs there should be mentioned the SYSTRAN system used by the European Union Commission’s machine translation service (English, German, French, Spanish, Greek and Italian). The practical operation of commercial machine translation is the CULT system (P.R.C.), and the systems offered by these companies: Logos Corp., Globalinc Inc., Toshiba Corp., CompuServe, *etc.*

The opportunity to use different types of dictionaries (specialized terminology and commonly used vocabulary) allows you to flexibly adjust the translation system to texts of different degrees of complexity, whereas different types of dictionaries can be assigned different degrees of priority. For example, when translating texts on artificial intelligence, we deal with the terms representing the field of computer technology, alongside with terms encountered in psychology, mathematics and general science [2]. It is logical to assume that the terms from the computer science field are more often used in the texts representing

artificial intelligence, so they are to be translated with the help of the computer terms dictionaries. In this case, the dictionary of computer technology terms should have a greater priority than other dictionaries, but if necessary, the program is simultaneously connected with the dictionary of commonly used vocabulary. When translating scientific and technical texts, it is expedient to assign the last priority to the latter dictionary.

It should be borne in mind that even a fine-setting of the system does not take into account all the features of the text vocabulary, therefore translated words having several synonyms give the opportunity to select the appropriate translation option or leave what the computer offers [1], [3]. Modern systems allow you to edit terms directly within the translation environment, as well as view search results the parameters of which can be restricted and configured. When the translation option is executed, you can begin post-editing of the translated text; the Word program used by students has powerful tools for this.

Let us remark that the translated text is subject to pre-editing, that means preparation for MT. Thus, in the process of decoding the abbreviations that have a dot in their composition, a MT system can be mistaken in finding matches or leave this unit without any translation, since the dot is perceived by the machine as a marker of the end of a sentence. The text submitted in the graphic form should not contain any word wrapping. The texts which are the result of scanning image recognition require special processing because they may contain errors. That is why it is convenient to choose the products in which the FineReader program is part of the package aimed at processing the texts “entered” into the computer by scanning.

Therefore, due to the clarity of the main purpose of translation, the range of topics, and the requirements to the quality of the result, one can determine which of the systems will be most suitable for solving specific translation tasks.

Online machine translation is worthy of special attention. The Internet is rapidly transforming from a predominantly English-language-based to a multilingual environment, which forces web site owners to provide information in several languages. At present, information and search sites that intend to attract multilingual users to their pages resort to the service of MT. The InfiniT (<http://www.infiniT.com>) is such an example of a frequently used portal which provides online two-way translation (based on English, German and French). As the practice of working with the students majoring in the Humanities has shown, Internet Explorer and Netscape Navigator are the usual tools for online users.

Judging by the above material, it is clear that modern MT systems are so diverse in their capacities that only a user can assess their features, advantages and disadvantages.

Modern computer-assisted translation tools and SDL Trados have become an integral part of the modern process of professional translation. The application of automation systems is considered effective while translating any type of documentation, where the repetition of structural and semantic text components ranges within 50% (not less). According to the results of the survey intended for the students who participated in the project, the time spent on translation using automation systems is reduced by half. These programs are based on the Translation Memory database – a linguistic database within which translations are stored by the user-translator as they are created. The usual composition of the TM database is the output segments and the target segments that are equivalent to them (as a rule, a sentence is regarded to be a segment). When processing a new text to be translated, a system compares each of its sentences with the ones stored in the database and “extracts” the corresponding matches. A specially designed system of Minimum Match Value is used in TM technology: a fuzzy (not exact) match, an exact match, a context (contextual) match. Thus, previously translated documents are an important resource for subsequent translations, since many repetitive fragments of the text can be similar or even identical [8], [10]. It should be noted that the students of the humanities departments prefer these MT systems (according to the results of the questionnaire).

One cannot help mentioning the most widely used system of automatic translation SDL Trados which is gaining considerable popularity with users in the field of professional translation. In order to accumulate the database and share ideas between users and third-party developers, the manufacturer has launched a special SDL OpenExchange program which provides additional useful applications for SDL Trados Studio and SDL MultiTerm. Today, the Google program is developing in the same way. As a result, users receive many additional opportunities: automation of batch file processing operations, translation database management, conversion and export into various formats, *etc.* Thus, during the translation process, users can preview the documents to be translated in their usual modes – Microsoft Word, Microsoft PowerPoint, HTML and XML, which can significantly reduce the time spent on editing and layout.

The rapid pace of the development of computer technology in the practice of translation persistently requires the improvement of the MT systems efficiency. Specialists associate an increase in the efficiency of constructing adequate MT systems with two directions: the development of artificial intelligence and the creation of the translation correspondences (conformity) corpus. The first direction is associated with the machine capacity to think like a human being and, accordingly, to translate from one language into another. The second direction is connected with the machine capacity to compile corresponding translation corpuses. It can be assumed that such work is carried out by different teams, but their actions are not coordinated, and therefore the result is too insignificant. Critics of modern MT systems believe that genre limitations (to teach the machine to understand at first very simple texts, specially selected ones) in practice have led to the fact that the task of modelling the natural language actually has given way to the task of modelling limited (often primitive) sublanguages within certain branches of knowledge [5 ], [6], [7], [8]. It is known that the Canadian system TAUM-METEO has achieved the best result in this way, as it perfectly fulfils the tasks of the English-French translation of weather forecasts. The automatic phrasebooks intended for tourists which offer the user a more or less varied “menu” of standard questions and answers in two or more languages are the simplest type of these systems.

Taking into consideration the theoretical ground of machine translation, the authors have elaborated the content-oriented structure of the future translators’ *specific competence in the sphere of machine translation* within the language pairs “English ↔ Ukrainian” and “Chinese ↔ Ukrainian”.

We conducted *experimental work* involving first-year Master students majoring in the English ↔ Ukrainian and Chinese ↔ Ukrainian translation (about 40 students). The experiment consisted of four stages: 1) pre-testing of the students (in order to determine the level of their basic knowledge and skills in machine translation; 2) propaedeutic preparatory training course; 3) after-testing (final testing); 4) assessment of the students’ outcomes.

As for the experimental work, 40 students of the humanities departments were divided into experimental (EG) and control (KG) groups. The knowledge and skills obtained by the future translators after the preparatory training course constituted the *professional competency of the future translators in the field of the English-Ukrainian MT* (criterion 1) and the *professional competency of the future translators in the field of the Chinese-Ukrainian MT* (criterion 2) represented by these indicators:

- *content-significant* – students’ awareness of the modern machine translation programs (FAMT, HAMT, MAHT) and their functional spectrum; knowledge of the terminology database in the field of machine translation and the ability to operate with the basic concepts (“translation conformance”, “translation memory”, “computer technologies”, “online translation”, “information and communication technologies” (ICTs), *etc.*);

- *procedural-technological* – students’ awareness of the peculiarities of the machine translation process; the ability to perform machine translation using the (systems) programs Pragma, Google, SDL Trados, *etc.*; skills of linguistic analysis of the source (original) texts and target (translated) texts; the ability to perform pre- and post-editing of texts; the ability to reproduce the text-frame of the original text in translation;
- *lexicographic search-oriented* – students’ awareness of the diversity and specificity of computer information sources and dictionaries; the ability to use electronic dictionaries in the genre-marked context; the skills of the correct choice of lexical units in computer dictionary sources in accordance with a particular branch of knowledge.

The academic success of the Master students turned out to be stipulated by the use of the competence-oriented and context-centred approaches to the educational process and combination of traditional (lectures, practical classes and seminars) and new interactive methods / forms of teaching / learning: interactive lectures; interactive business / role playing games; seminars – panel discussions. Let us consider some of them.

**Lecture-studio** “Modern MT programs: their functions, advantages and disadvantages”.

**Aim:** to improve students’ knowledge regarding the functional spectrum of the modern machine translation programs (FAMT, HAMT, MAHT); to stimulate their ICT skills.

**Procedure.** Students got acquainted with the essence of the proposed programs, the advantages of their use. Future translators expressed their views on the disadvantages of machine translation, cited their practical examples of using machine translation programs.

**Lecture-polylogue** “Terminology database: machine (automated) translation”.

**Aim:** to familiarize future translators with the terminology database in the field of machine translation; to motivate them to cognitive comprehension of the content of the basic concepts.

**Procedure.** Future translators of English and Chinese were invited to discuss key concepts such as “translation conformance”, “translation memory”, “computer technologies”, “online translation”, “information and communication technologies” (ICTs), etc. It should be noted that on the eve they independently worked out the mentioned concepts. The content of the lecture material facilitated students’ better understanding of the essence of the terminological construct and encouraged them to analyse its components. The context of the lecture allowed us to concentrate students’ attention on the problems that were raised, to stimulate their cognitive listening to the teacher and classmates.

During students’ mastering of the material within the *lecture-colloquium* “Computer Information Reference Sources and Dictionaries”, the classification of computer dictionaries types and the specificity of their use were represented.

**Aim:** to familiarize future translators with the typology of computer dictionaries and information sources; to teach students to use them under conditions close to professional ones.

**Procedure.** Students got acquainted with the information sources and dictionaries according to their classification determinants, explained the criteria of their classification. At the lesson, they discussed these linguistic phenomena: polysemy, synonymy and homonymy of multi-branch vocabulary. The future philologists-translators analysed the morphological composition of the terms according to their etymological features.

**Translation Workshop** “Find the Match”.

**Aim:** to teach students to independently process MT texts with the aim of choosing English and Chinese equivalents and to explain their own translation solutions.

**Procedure.** Students were asked to select English and Chinese correspondences to the lexical units in machine translation texts: *машини першого покоління, голосова пошта, якість перекладу, аналогова технологія, гібридні системи, відповідати вимогам,*

пошукові сайти, новітні технології, etc. The future translators evaluated the correctness of the chosen matches and commented on their translation solutions.

**Seminar-panel discussion** “Dictionaries-Assistants”.

**Aim:** to teach students to use a variety of online terminology dictionaries to translate English / Chinese terms into Ukrainian.

**Procedure.** The Master students majoring in Translation studied the functioning principles of various online terminology dictionaries, investigated the semantic “load” of multi-branch terms and represented the selected correspondences (giving their grounds).

Interaction of the disciplines (“Foreign language (English / Chinese) Major”, “Foreign language (English / Chinese) Minor”, “Theory and Practice of Translation”) contributed to the practical training of the students in fulfilling the tasks connected with machine translation of texts of various functional styles within the language pairs: “English ↔ Ukrainian” and “Chinese ↔ Ukrainian”.

**Exercise** “Art of Editing”.

**Aim:** to teach the future translators to perform pre-and post-editing of MT texts (on the material in English, Chinese and Ukrainian); to identify difficulties that need to be edited; to form skills to analyse the disadvantages and / or benefits of translation programs.

**Procedure.** The students performed the tasks in two stages. At the first stage, they were asked to scan a text after machine translation, to edit it and to identify the difficulties that need to be edited. They singled out these difficulties among the main ones: ignorance of some scientific and technological phenomena, inter-branch homonymy of terms, non-recognition of stylistic devices and expressive means in artistic texts (by MT programs). At the second stage, the future translators performed the post-editing of the proposed MT texts in the on-line mode. At the end of the lesson, students got the task to develop recommendations for choosing a machine translation program. Students gave priority to the programs Pragma, Google, SDL Trados.

The next analytical **exercise** “Determinants of machine translation quality” was devoted to the discovery of qualitative characteristics of machine translation.

**Aim:** to acquaint students with the criteria of machine translation quality; to form the skills of analysing the quality of machine translation within the above-mentioned programs.

**Procedure.** The future translators were given instructions to scan and compare variants of MT publicistic texts in English and Chinese, translated by means of the programs Pragma, Google, SDL Trados, according to the criteria: lexical, grammatical, stylistic, frame-targeted. The students detected machine translation flaws, evaluated the quality of machine translation and offered their own translation solution. As a result of the discussions, a set of versatile recommendations for the further use of machine translation programs was approved, which proved to be useful.

**Exercise** “SMS-translator”.

**Aim:** to improve the skills of using the programme MSN Messenger; to form the skills of translating SMS-messages in the online mode.

**Procedure.** Within the framework of the profession-oriented tasks, the students sent SMS messages to their groupmates’ mobile phones using the program MSN Messenger. The message recipients translated them online within the language pairs: “English ↔ Ukrainian”, “Chinese ↔ Ukrainian” and “English ↔ Chinese”. The students’ interest was stimulated by the opportunity to accompany the text messages with small animations and dynamic emoticon images that could change emotions.

The next exercises were used in all stages of machine translation from foreign languages into Ukrainian and from Ukrainian into foreign languages.

**Exercise** “Translator-Virtuoso” (Part I).

**Aim:** to improve the skills to use machine translation programs when translating from English and Chinese into Ukrainian within multi-branch texts; to improve the skills in giving the linguistic analysis of the source and target texts; to activate the cognitive comprehension of the adequacy / inadequacy of machine translation from foreign languages into mother tongue.

**Procedure.** The students independently chose English and Chinese style-marked texts (artistic, scientific and technical, official-business) and made their machine translation into Ukrainian. As a positive aspect, the future translators pointed out the feasibility of a comparative analysis of the adequacy of translation options. The groupmates shared their thoughts about the adequacy / inadequacy of the machine translation of certain passages. Some students found difficulty reproducing text-frames of official-business texts.

**Exercise** “Translator-Virtuoso” (Part II).

**Aim:** to improve the skills in using machine translation programs when translating from Ukrainian into English and Chinese within multi-branch texts; to improve the skills in giving the linguistic analysis of the source and target texts; to activate the cognitive comprehension of the adequacy / inadequacy of machine translation from mother tongue into foreign languages.

**Procedure.** The students independently chose Ukrainian style-marked texts (artistic, scientific and technical, official-business) and made their machine translation into English and Chinese. As a positive aspect, the future translators pointed out the feasibility of a comparative analysis of the adequacy of translation options. The groupmates shared their thoughts about the adequacy / inadequacy of the machine translation of certain passages. Some students found difficulty finding translation correspondence within the linguistic analysis of the Chinese artistic texts.

Table 1

**Comparative data demonstrating the proficiency levels of the professional competency in English-Ukrainian machine translation achieved by the future translators according to the results of the control testing (%)**

Stage	Groups	Indicators	Levels			
			high	sufficient	intermediate (satisfactory)	low
1	2	3	4	5	6	7
Indicating	EG	<i>Content-significant</i>	15,44	39,0	30,21	15,35
		<i>Lexicographic search-oriented</i>	14,71	39,96	37,53	7,8
		<i>Procedural-technological</i>	5,94	40,38	45,38	8,3
	<b>Total (EG)</b>		<b>12,03</b>	<b>39,78</b>	<b>37,71</b>	<b>10,48</b>
	KG	<i>Content-significant</i>	14,81	40,04	31,52	13,63
		<i>Lexicographic search-oriented</i>	14,84	40,15	37,52	7,49
<i>Procedural-technological</i>		5,6	40,6	45,4	8,4	
<b>Total (KG)</b>		<b>11,75</b>	<b>40,26</b>	<b>38,15</b>	<b>9,84</b>	
Final	EG	<i>Content-significant</i>	26,91	42,37	28,59	2,13
		<i>Lexicographic search-oriented</i>	30,52	46,47	21,04	1,97
		<i>Procedural-technological</i>	18,98	55,03	21,66	4,33
	<b>Total (EG)</b>		<b>25,47</b>	<b>47,96</b>	<b>23,76</b>	<b>2,81</b>
	<b>DIFFERENCE</b>		<b>+13,44</b>	<b>+8,18</b>	<b>-13,95</b>	<b>-7,67</b>
	KG	<i>Content-significant</i>	15,99	42,0	30,9	11,11
		<i>Lexicographic search-oriented</i>	14,72	39,08	39,21	6,99
		<i>Procedural-technological</i>	12,1	43,61	38,76	5,53
<b>Total (KG)</b>		<b>14,27</b>	<b>41,56</b>	<b>36,29</b>	<b>7,88</b>	
<b>DIFFERENCE</b>		<b>+2,52</b>	<b>+1,3</b>	<b>-1,86</b>	<b>-1,96</b>	

Thus, after completing the developed training course aimed at the formation of the future translators' competence in the sphere of machine translation students were to fulfil control testing within the developed indicators. The results of the data processing presented in table 1 and table 2 showed the dynamics of the proficiency levels demonstrated by the future translators within their *professional competency in the field of English-Ukrainian machine translation* (criterion 1) and their *professional competency in the field of Chinese-Ukrainian machine translation* (criterion 2) under these indicators: *content-significant, lexicographic search-oriented, procedural-technological*.

The students' academic success was assessed in compliance with the four-level evaluation system: the high level (90 – 100 points), the sufficient level (74 – 89 points), the intermediate / satisfactory level (60 – 73 points), the low level (0 – 59 points).

Thus, according to the results of the final testing /after-testing (*criterion 1*), 25,47% of the EG students reached the high level (12,03% before the experimental training course), 47,96% of the EG students showed the sufficient level (39,78% before the experimental training course), 23,76% of the EG students got the intermediate (satisfactory) level (37,71% before the experimental training course), 2,81% of the EG students demonstrated the low level (10,48% before the experimental training course); the KG had the following results: the high level – 14,27% (compared to 11,75%), the sufficient level – 41,56% (compared to 40,26%), the satisfactory level – 36,29% (compared to 38,15%), the low level – 7,88% (compared to 9,84%).

Table 2

**Comparative data demonstrating the proficiency levels of the professional competency in Chinese-Ukrainian machine translation achieved by the future translators according to the results of the control testing (%)**

Stage	Groups	Indicators	Levels			
			high	sufficient	intermediate (satisfactory)	low
1	2	3	4	5	6	7
Indicating	EG	<i>Content-significant</i>	12,48	29,48	32,44	25,6
		<i>Lexicographic search-oriented</i>	11,63	49,91	32,86	5,6
		<i>Procedural-technological</i>	5,43	39,94	45,13	9,5
	<b>Total (EG)</b>		<b>9,85</b>	<b>39,77</b>	<b>36,81</b>	<b>13,57</b>
	KG	<i>Content-significant</i>	12,1	29,45	32,64	25,82
		<i>Lexicographic search-oriented</i>	11,58	50,14	32,68	5,6
		<i>Procedural-technological</i>	4,66	40,56	44,98	9,8
<b>Total (KG)</b>		<b>9,45</b>	<b>40,05</b>	<b>36,76</b>	<b>13,74</b>	
Final	EG	<i>Content-significant</i>	25,96	40,66	26,5	6,88
		<i>Lexicographic search-oriented</i>	23,6	53,25	21,5	1,65
		<i>Procedural-technological</i>	19,84	55,78	20,64	3,74
	<b>Total (EG)</b>		<b>23,13</b>	<b>49,90</b>	<b>22,88</b>	<b>4,09</b>
	<b>DIFFERENCE</b>		<b>+13,28</b>	<b>+10,13</b>	<b>-13,93</b>	<b>-9,48</b>
	KG	<i>Content-significant</i>	12,49	29,64	34,3	23,57
		<i>Lexicographic search-oriented</i>	13,02	49,3	32,3	5,38
		<i>Procedural-technological</i>	10,94	43,59	38,38	7,09
	<b>Total (KG)</b>		<b>12,15</b>	<b>40,84</b>	<b>34,99</b>	<b>12,02</b>
	<b>DIFFERENCE</b>		<b>+2,7</b>	<b>+0,79</b>	<b>-1,77</b>	<b>-1,72</b>

Within the *second criterion* (Table 2), the experimental groups showed an increase in the number of students who mastered the material at the high (+ 13,28%) and sufficient (+ 10,13%) levels; in the control groups, respectively, – by 2,7% and 0,79%. It should be noted that after the initiated training on machine translation, the increase and decrease within the indicators according to the first and second criteria were insignificant: in the experimental

groups much more students reached the high level (their number increased by 13,44% and 13,28%); the number of students who demonstrated the sufficient level increased by 8,18% and 10,13%, respectively; in the control groups few students achieved the high level of professional competence in the field of machine translation (their number increased only by 2,52% and 2,7%); the number of students who demonstrated the sufficient level increased by 1,3% and 0,79%, respectively.

We might assume that the EG students improved their professional competence in the field of machine translation due to the proposed methodological system (using modern computer technologies), which facilitated students' motivation to productively cooperate with their university teachers in the framework of the experimental training; whereas the KG students' academic activities proved to be of a linear character without taking into account significance of using MT programmes in professional sphere.

#### 4. CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

The analysis of the function mechanisms of the modern machine translation programs confirmed the necessity of human assistance in the process of converting source texts into target texts (Machine-Assisted Human Translation) at each stage (linguistic analysis of the source text at all language levels, conversion, pre-editing, post-editing, final framing of the target text). That is why there is a need for additional special training which is aimed at teaching future translators to work with machine translation programs in order to save their time, to "navigate" information environment that is progressing rapidly both in terms of its content and easy use, transforming in accordance with the development vectors of modern science, technology, economics, intercultural communication and so on.

To conclude, the methodological support, in our opinion, allowed the formation of the students' basic knowledge and proper proficiency level in the process of mastering the experimental course of machine translation within the language pairs: "English ↔ Ukrainian", "Chinese ↔ Ukrainian". Let us specify the students' outcomes.

According to *the content-significant indicator* the students demonstrated their awareness of the modern machine translation programs (FAMT, HAMT, MAHT) and their functional spectrum; the knowledge of the terminology database in the field of machine translation.

As far as *the procedural-technological indicator* is concerned, the students obtained the knowledge about the peculiarities of the machine translation process from English / Chinese into Ukrainian and from Ukrainian into English / Chinese.

As for *the lexicographic search-oriented indicator*, the students enriched their knowledge regarding the diversity and specificity of computer information sources and dictionaries.

Among the developed *basic professional skills and abilities*, we could single out the following skills / abilities:

- the ability to operate with the basic concepts ("translation conformance", "translation memory", "computer technologies", "online translation", "information and communication technologies" (ICTs), etc.) – according to *the content-significant indicator*;
- the ability to perform machine translation using the (systems) programs Pragma, Google, SDL Trados, etc. on the material of English, Chinese, Ukrainian; the skills of linguistic analysis of the source (original) texts and target (translated) texts; the ability to perform pre- and post-editing of texts; the ability to reproduce the text-frame of the original text in translation – according to *the procedural-technological indicator*;

- the ability to use electronic dictionaries in the genre-marked context; the skills of the correct choice of lexical units in computer dictionary sources in compliance with the branch of knowledge the text belongs to – according to *the lexicographic search-oriented indicator*.

Prospects of the further research are seen in the study of machine translation in an educational aspect grounded on theory and practice of translation (both fully automated and human assisted) and the latest developments in the fields of comparative linguistics and general theory of translation (theory of regular correspondences, methods of representing knowledge, optimizing and improving linguistic algorithms, in particular).

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*Text of the article was accepted by Editorial Team 20.11.2018*

## НАВЧАННЯ СТУДЕНТІВ ГУМАНІТАРНИХ СПЕЦІАЛЬНОСТЕЙ МАШИННОГО ПЕРЕКЛАДУ

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**Анотація.** Проблеми машинного перекладу (МП) корелюємо з найбільш актуальними векторами, які визначають розвиток змісту кваліфікаційних характеристик професії перекладача, що знаходить своє відображення в різноманітності підходів до вдосконалення алгоритмів прикладних програм у цій галузі знань. Визнаємо нагальність теоретичного переосмислення якості підготовки майбутніх філологів і перекладачів засобами ІКТ для сприяння їх природній і швидкій адаптації до професійної діяльності та конкурентоспроможності на ринку праці. Аналіз фахової літератури засвідчив важливість використання комп'ютерних технологій при навчанні майбутніх перекладачів МП і довів, що використані не всі резерви для його ефективного забезпечення. Актуальність проблеми і відсутність її належного розроблення зумовили мету статті – аналіз і розробка педагогічних засобів, що сприяють формуванню системи знань і вмінь з проблем застосування сучасних комп'ютерних технологій у процесі професійної діяльності (на матеріалі англійської, китайської та української мов). У статті репрезентований спектр програм МП за ступенем втручання людини до процесу перетворення тексту оригіналу на текст перекладу (FAMT, НАМТ, МАНТ); визначено критерії (професійна компетенція майбутніх перекладачів у галузі англо-українського МП, професійна компетенція майбутніх перекладачів у галузі китайсько-українського МП), показники (контентно-значущий, процесуально-технологічний та лексикографічно-пошуковий) та рівні (високий, достатній, задовільний, низький) сформованості знань і вмінь майбутніх перекладачів користуватися сучасними комп'ютерними технологіями в межах реалізації професійної діяльності. Запропонована авторська методика передбачала використання компетентнісного і контекстного підходів до освітнього процесу, інтеграцію традиційних і нових інтерактивних методів / форм навчання, комбінування аудиторної та позааудиторної діяльності із залученням ІКТ. Перспективним вважаємо подальше дослідження МП у педагогічному аспекті на основі розвідок у таких галузях, як-от: порівняльне мовознавство і загальна теорія перекладу, зокрема теорія закономірних відповідностей, способів подачі знань, оптимізації і вдосконалення лінгвістичних алгоритмів.

**Ключові слова:** комп'ютерні технології; машинний переклад; майбутні перекладачі; критерії; показники.

## **ОБУЧЕНИЕ СТУДЕНТОВ ГУМАНИТАРНЫХ СПЕЦИАЛЬНОСТЕЙ МАШИННОМУ ПЕРЕВОДУ**

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**Аннотация.** Проблемы машинного перевода (МП) коррелируют с наиболее актуальными векторами, которые определяют развитие содержания квалификационных характеристик профессии переводчика, что находит свое отражение в разнообразии подходов к совершенствованию алгоритмов прикладных программ в этой области знаний. Признаем актуальность теоретического переосмысления качества подготовки будущих филологов и переводчиков средствами ИКТ для содействия их естественной и быстрой адаптации к профессиональной деятельности и конкурентоспособности на рынке труда. Анализ профессиональной литературы показал важность использования компьютерных технологий при обучении будущих переводчиков МП и доказал, что использованы не все резервы для его эффективного обеспечения. Актуальность проблемы и отсутствие ее надлежащей разработки обусловили цель статьи - анализ и разработка педагогических средств, способствующих формированию системы знаний и умений по проблемам применения современных компьютерных технологий в процессе профессиональной деятельности (на материале английского, китайского и украинского языков). В статье представлен спектр программ МП по степени вмешательства человека в процесс преобразования текста оригинала в текст перевода (FAMT, НАМТ, МАНТ) определены критерии (профессиональная компетенция будущих переводчиков в области англо-украинского МП, профессиональная компетенция будущих переводчиков в области китайско-украинского МП), показатели (контентно-значимый, процессуально-технологический и лексикографически-поисковый) и уровне (высокий, достаточный, удовлетворительный, низкий) сформированности знаний и умений будущих переводчиков пользоваться современными компьютерными технологиями в рамках реализации профессиональной деятельности. Предложенная авторская методика предусматривала использование компетентностного и контекстного подходов к образовательному процессу, интеграцию традиционных и новых интерактивных методов / форм обучения, комбинирование аудиторной и внеаудиторной деятельности с привлечением ИКТ. Перспективным считаем дальнейшее исследование МП в педагогическом аспекте на основе исследований в таких областях, как: сравнительное языкознание и общая теория перевода, в частности теория закономерных соответствий, способов подачи знаний, оптимизации и совершенствования лингвистических алгоритмов.

**Ключевые слова:** компьютерные технологии; машинный перевод; будущие переводчики; критерии; показатели.



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