The Interface of *Nous* and Computer in Inter-disciplinary Research, Communication and Education

Ekaterini Nikolarea[1]
University of the Aegean

Abstract[2]

*This study is a meta-cognitive discussion about whether non-English scientists know about the existence of computer tools – such as monolingual, bilingual and multilingual electronic dictionaries, CAT [Computer Assisted Translation] tools - and whether they know how to use them in order to communicate their inter-disciplinary research internationally. It also discusses what is at stake when concepts such as inter-scientificity (i.e. "bar", with 17 different terms in Greek) and reverse inter-scientificity (i.e. "πρόγραμμα" [: program] with at least 6 different terms in English) emerge. Then the author of this study claims that **only** human mind/intelligence (nous) - with the aid artificial intelligence (computer – CAT tools) and through different mental/cognitive processes (noesis) can establish certain criteria in choosing appropriate terms and expressions, so that an inter-disciplinary research can be communicated properly and thus (international) scientific communication can be achieved effectively. Finally, the author of the present study proposes that Higher Education Institutions [HEIs] in North America (the USA and Canada) and Europe should get involved in educating and training both their large number of international students and staff administrative and academic), if a proper international inter-disciplinary communication is to be attained.*

Keywords: *nous (HI), computer (AI), SWOT analysis, inter-scientificity, reverse inter-scientificity, Terminological Data Bank (TDB) Higher Education Institutions [HEIs]*

1. Introduction

This study is a meta-cognitive reflection on whether non-English scientists know about the existence of computer tools – such as electronic

[1] Ekaterini Nikolarea, School of Social Sciences, University of the Aegean (Lesvos, Greece) (anikolarea@geo.aegean.gr).

[2] *I would like to thank the peer-editor of the final version of the present study Professor Elias Kourliouros (ekourliouros@upatras.gr) in the Department of Economics, School of Economics and Business, University of Patras (Rio 26504, Patras, Greece) for reading and commenting upon this paper. I would also thank Professor George Korres (gkorres@aegean.gr) in the Department of Geography, School of Social Sciences, University of the Aegean (Lesvos, Greece) who, as a non-anonymous peer reviewer, has helped me to enhance the present study.*

dictionaries, CAT tools and whether they know how to use them in order to communicate their inter-disciplinary research at a global level.

The first part of the study ventures a philosophical and an etymological exploration into human intelligence (*nous*) and artificial intelligence (computer / *computare*), and a SWOT analysis that their interface offers to all scientists and, especially, to those whose English (*lingua franca:* common/shared language) is not their mother tongue.

The second part presents a plethora of CAT tools that are provided to non-English scientists, such as machine translation, Trados, Corpora, and what happens when English and non-English scientists who carry out an inter-disciplinary research "hit" on polysemy of scientific discourse and have difficulty to communicate with each other, let alone to communicate their research to a wider audience and/or readership. The author provides a notorious example of inter-scientificity and a challenging case reverse inter-scientificity. On the one hand, the term "bar" – which has 17 different meanings in English scientific discourse but 17 different terms in Greek, and, on the other hand, the Greek tantalizing term πρόγραμμα – which has 6 different meanings in Greek but 6 different terms in English (i.e. programme and/or program, curriculum, syllabus etc.), depending on the context.

In the third part of the study, and, having discussed what is at stake with concepts of inter-scientificity (i.e. "bar") and reverse inter-scientificity (i.e. "πρόγραμμα"), the author claims that **only** human mind/intelligence (*nous*) - with the aid artificial intelligence (computer – CAT tools) and through different mental/cognitive processes (*noesis*) - can establish certain criteria when s/he is ready to choose appropriate terms and expressions, so that s/he can communicate his/her inter-disciplinary research properly and thus s/he can attain an effective international scientific communication.

Given the multi-leveled complexity of the interface of human and artificial intelligence in inter-disciplinary research within an international scientific context, the author – in the last part of the study - proposes that Higher Education Institutions [HEIs] in North America (with a large number of international students and scholars) and HEIs in Europe that have

established or are to establish international programs in English should, first, become "aware" (*nous* - *noesis*) of the concepts of inter-scientificity and reverse inter-scientificity and, then, educate and/or train their administrative and academic staff in these concepts, how to use translation tools [e.g. CATs) and how to construct a bilingual Terminological Data Bank (TDB) appropriately so that they can attain an appropriate and an effective scientific communication at a global level.

2. Human Intelligence (HI or *Nous*) vis-à-vis Artificial Intelligence (AI or Computer/ *Computare*)

2.1. Human Intelligence *(Nous)*

In philosophy, *nous* (*νοῦς* in Ancient Greek) or human intelligence (HI), which is usually rendered as "mind" or "intellect", is the intellectual power of humans, which can perform complex cognitive feats; it describes the activity of the faculty of intellectual apprehension (**understanding**) and intuitive thought (**intuition**). *Nous* enables humans to remember

descriptions of things (**human memory**) AND USE THEse descriptions in future behaviors. Intelligence or *nous* endows humans (with) cognitive abilities to learn, understand and form abstract ideas and concepts, understand, and reason (as a verb comes from *noein* [*νοεῖν*] – a verb in ancient Greek that cognates from *nous* and describes the process of *noeisis* [*νόησις*]); that is of reasoning AND/OR AWARENESS. *Nous* can also experience, perceive, think, become aware of a situation, acquire self-awareness, recognize patterns, innovate, plan, solve problems arise in a given socio-cultural environment (*milieu*), processes that are related to *epistēmē* (*ἐπιστήμη*), a term that in philosophy

and classical rhetoric is the domain of true knowledge and usually refers to a principle system of understanding or, otherwise, scientific knowledge.

If it is so, then *nous*, trying to understand the (chaotic) universe around him/her and put an order to that, s/he first becomes aware (*noein* -*νοεῖν*) of the specific universe, and then s/he sets some rules (principles), if s/he wants to function in this universe. In other words, s/he exercises his/her "reason" or "logic" (two other English translations of *nous*) on his/her natural, linguistic and cultural environment (*milieu*), if s/he wants to comprehend where s/he stands in this universe. By doing this, *nous* undergoes rigorous thinking processes; and it is these mental/intellectual rigorous thinking processes (*noesis* - *νόησις*) that generate "intellectual production" and/or *epistēmē* (*ἐπιστήμη*) or true knowledge. After these mental/intellectual rigorous thinking processes (*noesis* - *νόησις*), HI or *nous* uses a language (when an English monolingual scientist uses English as *lingua franca*) or languages (when a non-English scientist uses English as *lingua franca*) in an international context to communicate his/her *epistēmē* (*ἐπιστήμη*) and/or research.

2.1.1. A SWOT Analysis of HI or *Nous*: From the aforementioned paragraphs, we can claim the following:

Strengths: HI or *nous* can experience, think, acquire self-awareness, remember, recognize patterns, innovate, plan, solve problems, carry out research, thus generating intellectual production" and *epistēmē* or true knowledge, and, finally, communicate all these linguistically to other human intelligences, human minds or *noes* (*νόες*).

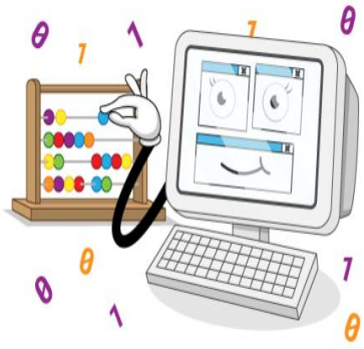
Weaknesses: HI or *nous* can fail to recognize certain patterns, his/her memory can fail him/her and, due to linguistic misuse of scientific terminology and/or discourse, can generate a breakdown of communication.

Opportunities: HI or *nous* can learn and develop several kinds of skills, such as cognitive and/or linguistic associations etc.

Threats: HI or human mind or *nous* can be totally dysfunctional due to brain damage caused by an accident, different neurodegenerative diseases, such as dementia or Alzheimer's disease, amnesia (temporary or total loss of memory), aphasia (inability to comprehend and formulate language due to the damage to brain regions).

2.2. Artificial Intelligence (AI or Computer / *Computare*)

"Computer" comes from the Latin *putare* which means both to think[3] and to prune[4] and, more specifically from *computare* (com- means "together") also meant calculate.[5]



On the one hand, "compute", as a verb, has been used for centuries in the English language. In the middle of the seventeenth century, Samuel Pepys used it as "calculating" in his phrase: "computing the 30 ships' pay… and it comes to £6,538. I wish we had the money." On the other hand, "computer", as a noun, was used for a person who did calculations. Moreover, what is interesting in this etymological endeavour is that "count", a Middle English verb, derivers from the Old English "compute", which cognates from *computare*. The most recent and most familiar meaning of the word "computer" that came to mean an electronic device used to store and communicate information (and all of its subsequent functions) occurred in the 1946 version of *Oxford English Dictionary, where its earliest citation appeared.*

2.2.1. A SWOT Analysis of a Computer: There is a vast literature on strengths, weaknesses, opportunities and threats of the use of a computer. In this sub-section, the author of this study will refer to the most important ones that are useful for her to elaborate her discussion about the use of computers and computer tools in the next (sub-) sections of the present study.

[3] This comes from one of the most famous Latin quotations by the Latin playwright Terence: "*humani… nihil alienum puto*", that is, "I think [is] nothing human foreign to me" (*Heauton timoroumenos*, 1.1, 75-77); the author's translation.
[4] This comes the *Georgics* (2.407) written by the Latin poet Virgil, where there are depictions of country life and, more specifically, "*fingitque putando*", that is, "tidying vines by pruning"; the author's translation.
[5] This meaning is encountered in *Natural History* written by the Latin historian Pliny, when telling how the breadth of Asia should be "*sane computetur*" or "rightly calculated" (VI, 33, 211); the author's translation.

Strengths:

1) ***Speed:*** A computer can perform tasks much faster than human mind (*nous*). It can perform the millions of calculations in a few minutes that a *nous* can takes many days to perform.
2) ***High Storage and Memory Capacity:*** A computer can store a great number of data for short and long time, something that cannot be done by *a nous,* whose memory usually fails him/her. Nevertheless, it is a user (*nous*) that can retrieve and use these data.
3) ***Accuracy*****:** A computer is more accurate than a human for solving any of the normal or typical problems. Nevertheless, it is only a *nous* that can solve problems that arise in international inter-disciplinary research, as discussed in 4.2.
4) ***Automatic*****:** A computer is also a type of automatic machine which can perform a loop of tasks automatically according to the instructions given by a user (*nous*).
5) ***Diligence***: A computer is able to work for many hours and hours without taking any rest and without decreasing its abilities like speed, accuracy, efficiency, etc.
6) ***Reliability:*** A computer is a machine that does not get tired like *nous;* it is responsive and does not bore even after continuous working for a long time.
7) ***Versatility*****:** A computer can do a set of repetitive jobs more efficiently, and has the ability to perform several types of tasks, such as audio, graphic, visual characters, etc., at the same time, something that a human (*nous*) cannot do due to his/her physical exhaustion.

Weaknesses: A computer:

1) cannot draw conclusions from amounts of data; it needs a user (*nous*);
2) cannot make decisions while acknowledging their effect on the world like *nous* can;
3) cannot make decisions that require a general understanding of the world;
4) cannot establish a conversation as *nous* can;
5) is not creative and imaginative, unless a *nous* helps it; and
6) has neither feelings nor conversational skills as a human (*nous*) does. Thus, a computer cannot perceive and understand a socio-cultural situation or what is involved in the interaction of different socio-cultural

and scientific situations, as expressed within the context of international inter-disciplinary research and education, as discussed in sub-section 3.2 of this study.

Opportunities: AI has a great variety of applications for better (i.e. robotics in medicine, computer use in education, to name a few) or worse (i.e. spying, illegal processing of data) for HI or *nous* or humanity in general. It can further be developed so to facilitate and improve human life and research.

Threats: The following types of threats can be caused by:

1. ***Physical damage***, such as fire, water, pollution;
2. ***Natural disasters***;
3. ***Crushing*** due to loss of power supply and/or telecommunication;
4. ***Equipment and/or software failure***;
5. ***Malicious abuse of data***, such as: plagiarism (i.e. theft of copyrights), spying, and/or illegal processing of data for showing-off and recognition of another user (*nous*); and
6. ***Negligence and compromise***, such as in cases where key factors of network safety and sustainability are either neglected or compromised.

2.2. Interface of HI (Nous) and AI (Computer): Complementarity and Interdependency[6]

From the aforementioned SWOT analysis of HI (*nous*) and AI (*Computer*), it becomes apparent that these intelligences need each other, since HI (*nous*) cannot perform the jobs and tasks that AI can do and vice versa.

On the one hand, any kind of terrestrial (medical included), aerial, extra-terrestrial or sub-marine research cannot be carried out unless there are computer programs or computerized engines that are programmed by humans or HIs or *noes* to perform tasks that they themselves cannot; for example, exploring deep seas by oceanographers can be done only with the aid of an AI, that is a bathyscaphe or a deep-diving submarine. On the other

[6] For a similar discussion about the interconnectedness of HI and AI but from an AI point of view, see Poirier, P. (Nov, 17, 2017), Four Human Strengths and AI Weaknesses; available at: https://medium.com/eruditeai/four-human-strengths-and-ai-weaknesses-a0fc1d38d538. Retrieved January 3, 2021.

hand, AI (a computer or a computerized program) cannot exist by itself. It needs HI(s) (i.e. a user or users [*nous* or *noes*]) to insert data – and at time to guide it – in order to operate and generate outcomes /data or knowledge (*epistēmē* - *ἐπιστήμη*) that can be used by the user(s) [*nous* or *noes*]. With the rapid advancement of New Technologies and their interaction or interface with humans (*noes*), complementarity and interdependency between HI (*nous*) and AI (computer) have become increasingly discernible.

Nevertheless, complementarity and interdependency between HI (*nous*) and AI (computer) become very conspicuous and quintessential in international inter-disciplinary research, in which English and non-English researchers participate and during which various researchers have to communicate their ideas to their colleagues (and/or to a wider audience/readership) in a *lingua franca* – a common/shared language – which is English, a language that is not the mother tongue of non-English researchers. *What happens then? How can a non-English researcher communicate his/her own research in a foreign language and scientific discourse (i.e. in English)? What happens when a non-English researcher 'hits on' the unexpected polysemy of scientific discourse and how can s/he be sure that s/he renders (translates) properly polysemic terminology so to be understood by other researchers and thus to achieve an international scientific communications?*

Questions like the above that turn around *how an international (scientific) communication is achieved* are the least explored internationally.

In the following sections and sub-sections, the author of this study makes an effort to show: (1) how the interface of HI (*nous*) and AI (computer) - through multilingual electronic dictionaries, CAT [Computer Assisted Translation] tools and another translation tool (i.e. a bilingual TDB [Terminological Data Bank]) which has been developed and taught at a non-English University by the author of this paper (Nikolarea, 2003 a and b; 2004a and b; 2005; 2019a; 2020) – can help a researcher to become '**aware**'

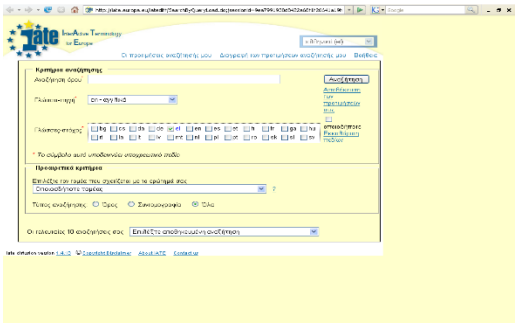
(*noein* - *voεῖv*)[7] of the complexity of the polysemy of scientific discourse; and (2) how a researcher can give solutions to issues on 'inter-scientificity' and 'reverse inter-scientificity' in order to achieve an international communication of his/her research. Here, it should be noted that this effort will be from a linguistic, discursive, translation and education point of view.

3. AI in the help of communication of Inter-disciplinary Research to an International public

3.1. Electronic dictionaries, forums and CAT [Computer Assisted Translation] tools in the help of non-English researchers

The importance of AI (computer) for HI (*nous*), apart from other applications and uses, is demonstrated with the plethora of bilingual and/or multilingual electronic dictionaries and CAT tools that are provided on the **Internet**, and come in the help of non-English researchers, provided that these researchers are '**aware**' (*noein -voεῖv*) of their existence.

3.1.1. Electronic dictionaries and Word Reference Forums: *Bilingual and/or Multilingual electronic dictionaries.* In some of her past publications (Nikolarea 2004a, 2005), the author of this study referred to EuroDicAutom [http://europa.eu.int/eurodicautom/login.jsp] which has been evolved and renamed to **IATE** (: Inter-Active Terminology for Europe; available at https://iate.europa.eu/search/standard/result/byUrl/1). According to the site, IATE is the largest terminology database in the world today, since it has over 8 million (economic, technical, AI) terms covering the 24 official languages of the EU. Nevertheless, despite the fact that IATE is an excellent tool for sciences and Social Sciences such as Economics, it lags behind in Social Sciences, such as Anthropology, Sociology and Political Science, and in Humanities.



[7] *Noein* [*voεῖv*] is a verb in ancient Greek that cognates from *nous* (*voῦς*) and describes the process of *noeisis* [*νόησις*], as discussed in Sections 2 and 4 in the present study.

Word Reference Forums

Word Reference Forums come in a variety of languages and pop up on the screen of a computer (AI) when a user (HI or *nous*) types his/her query in one of the search engine machines that the Internet provides.

3.1.2. CAT Tools: Machine Translation (MT) Engines. The sites: (1) https://lingohub.com/blog/2018/11/find-good-machine-translation-engines; and (2) https://www.smartling.com/resources/101/state-of-machine-translation/ name which MT engines of the existing ones are the best, according to their managers' view.

Within the present context, it should be noted that MT engines can be distinguished into the following two major categories:

(1) Statistic-based engines that use a statistical analysis of a bilingual text that is usually provided by the developer or the user (HI or *nous*). These engines apply existing rules to determine the relationship between the source language (SL) or the original text and the target language (TL) or the translated text. Experience has shown that in highly scientific texts the Statistic Based MT engines are not so accurate, and the outcome of this AI (i.e. the TL or translated text) has to be edited either by the researcher himself/herself or a professional translator (HI or *nous*).

(2) Neuro-based engines that are neural networks designed to imitate how the human mind learns, thus acquiring knowledge overtime. These engines are programmed to understand the context of what is to be translated to provide the appropriate term choice. Nevertheless, experience has shown that in highly scientific texts the Neuro-based MT engines, like the Statistic-based MT engines, fail to choose the right term (when there is polysemy of scientific discourse in the given text – an issue that is discussed in Sections 3 and 4), and thus the outcome of this AI (i.e. the TL or translated text) has to be edited either by the researcher himself/herself or a professional translator (HI or *nous*) – as in the case of Statistic-based engines again.

Trados

Trados or SDL Trados Studio 2021 (https://www.sdltrados.com/products/trados-studio/whats-new.html) is a purchasable translation software for professional translators, project managers (*noes*) and other users (*noes*), since there are available videos of how to use SDL Trados Studio 2021.

3.1.3. Corpus (pl. Corpora): A corpus or, better known as Corpora, is a database of language samples for finding out how some words and/or terms are used. It/they is/are usually used for linguistic research by scholars/researchers who know what to search for and how to use it in general. Corpora can be based on written or spoken language, and some are either tagged or annotated by part of speech or plain text.

There are monolingual, bilingual and/or multilingual corpora.

(1) Examples of lists of **monolingual corpora** are available at:
   - https://guides.lib.umich.edu/c.php?g=282869&p=1884909 (for English);
   - https://www.greek-language.gr/greekLang/modern_greek/bibliographies/corpora/index.html (for Greek);

(2) *Linguee* is an example of a **bilingual corpus** (English: Greek) that can be explored at: https://www.linguee.com/english-greek/translation/corpora.html

(3) There is also an example of engine machine that provides a list of **multilingual corpora** at: https://aclweb.org/aclwiki/Multilingual_Corpora

Corpora are usually free of charge, and can be a useful tool up to a certain point. Having been designed to cater linguistic research, language learning and philological studies, corpora cannot help much when a non-English researcher (*nous*) tries to find any possible equivalences between scientific terms in his/her mother tongue and English. And this happens, to the best of the author's knowledge, due to the fact that: (1) there are no corpora that have been designed to cater specific scientific domains; and (2) there are a

few bilingual corpora juxtaposing scientific texts written in two different languages. A good effort is *Linguee* the **bilingual corpus** (English: Greek), which, however, falls short when it comes to highly specialized texts; and this happens due to the lack of a compilation of such a bilingual corpus.

3.2. Issues of 'inter-scientificity' and 'reverse inter-scientificity'[8]

As discussed in 3.1., there is a plethora of bilingual/multilingual dictionaries, CAT tools and corpora not only for professional translators but also for non-English researchers. However, *what happens when a non-English researcher 'hits on' polysemy of scientific discourse – which is usually generated from the inter-disciplinarity of several scientific domains – and has to choose one of the 17 terms (see Figures 1 and 2) or one of the 6 terms (see Figure 3), if s/he wants to communicate his/her research in English (lingua franca) to an international public? Or, otherwise, what happens when a non-English researcher encounters issues that are raised with the presence of 'inter-scientificity' and/or 'reverse inter-interscientificity'?*

3.2.1. The origins and explanation of these concepts: From early on (2000-2001) in her teaching ESP/EAP[9] at the University of the Aegean (a Greek public University), the author of this paper came across the polysemy of scientific discourse that is generate from the interaction of several and distinct disciplines (i.e. inter-disciplinarity). She was able to become '**aware**' (*noeisis - νόησις*) of this phenomenon because she was a trained translation scholar and practitioner[10] - when a colleague of hers who was a Spatial Analyst at the time had the naïve view and argued that "scientific discourse cannot be polysemous – there is only one to one (1:1) equivalence in English and Greek terms".[11]

[8] See Nikolarea, 2019a and b.
[9] ESP: English for Specific Purposes; EAP: English for Academic Purposes.
[10] She was awarded her PhD in Comparative Literature, with specialization in Translation Studies, by the University of Alberta, Edmonton, AB, Canada.
[11] That colleague was the deceased Professor Pavlos Kanaroglou († 2016), who was the Chair of the Department of Geography at the University of the Aegean at the time. From that debate, on the one hand, Nikolarea started developing new teaching methodologies of Academic English, and, on the other hand, Kanaroglou and Nikolarea co-operated and compiled a bilingual (English: Greek) TDB (Terminological Data Bank) on Spatial Analysis in 2001. That TDB was accessible only to Geography students of the University of the Aegean. This TDB is now available to a wider public

That debate between a scientist and a trained linguist and translation scholar/practitioner became the springboard for the latter to explore how polysemy of scientific discourse is manifested in an international context when English (the *lingua franca* or the language of international/**global** communication) meets and interacts with a **local** language (e.g. Greek, Spanish, Russian etc.).[12] From her experience, as a translation scholar and practitioner, she observed that during the interaction of the global with the local there are problems of 'untranslatability' or linguistic asymmetries that are usually created by the *polysemy* of scientific discourse in an international (*glocalized*) scientific context. Although these problems are common issues in Translation Studies and the common practice for translation scholars and practitioners is to find solutions (Maginot, 2015) - if 'scientific' communication between two different linguistically scientific discourses (thus, '*inter*-scientific') is to be achieved, it is almost totally unknown in the wider scientific community due to the fact that non-English researchers are not trained (as translations practitioners are) to recognize these issues. Therefore, 'inter-scientificity' is meant non-English researchers' ability to move with ease between at least two linguistically different scientific contexts and comprehend inter-scientific differences not only across disciplines but also across different linguistic systems and cultures, without de-contextualizing scientific discourse from its respective linguistic, socio-political and cultural context(s). On the contrary, they should explore the interrelationship between scientific and general language as well as other aspects of human life and experience, at a time when interdisciplinary and multidisciplinary approaches to socio-political, economic and environmental issues are of first priority for the students and scholars of these scientific fields. Thus, 'inter-scientificity' can be considered a skill acquired by those non-English researchers who can distinguish between various readings of a polysemous terminological entity (or *polyseme*) and can use this *polyseme* accurately in at least two linguistically different scientific discourses (e.g. English: Greek).

---

in P. Kanaroglou, E. Nikolarea, S. Anomeritou "English-Greek Glossary of Spatial Statistics" (2021), pp. 9-52.

[12] In other publications the author of this paper calls this situation *glocalization* (derived from *glo*balization + lo*calization*) and such an international context a *glocalized* one (Nikolarea, 2005, 2006, 2019a and b).

3.2.2. A notorious example of inter-scientificity [English: Greek]: To illustrate what 'inter-scientificity' means in actual use and how complex and challenging for a non-English (Greek in the present study) researcher is, the English term "bar" is provided as an example of 'interscientificity' (Figures 1 and 2), and is notorious because, whereas "bar", as **one English** term, has 17 different **meanings**, in **Greek** this term can be rendered in **17** different **terms**, according to the scientific context and the specific domain. At this point, it should be mentioned that Figure 2 is a literal translation in English of Figure 1, so that a wider English public can follow the discussion that follows.

Bar: (1) *Ράβδος, χάρακας.* (α) Επίμηκες τεμάχιο μικρού μήκους. (Γενικά, ΜΑΘ, ΜΗΧΑΝ). (β) *Χάρακας*, στη Πληροφορική. Απόλυτο συνώνυμο του όρου αυτού είναι ο όρος **ruler**. (ΠΛΗΡΟΦ). (2) *Ράβδος χρυσού.* (ΟΙΚΟΝ, ΤΡΑΠΕΖ). (3) «*Σοκολάτα*». Μαριχουάνα σε μορφή πλάκας σαν σοκολάτα. (4) *Ράβδωση.* (5) *Στήριγμα.* Απόλυτο συνώνυμο του όρου αυτού είναι ο όρος **stud**. (ΜΗΧΑΝ) (6) *Λεπίδια, δοκός στήριξης.* (ΜΗΧ). (7) *Τραβέρσα, δέσιμο.* Απόλυτο συνώνυμο του όρου αυτού είναι ο όρος **truss**. (ΜΗΧΑΝ). (8) *Ραβδοχάλιβας.* (ΜΗΧ, ΧΗΜ). (9) *Κιγκλίδωμα.* (ΒΙΟΛ, ΙΑΤΡ). (10) *Φράγμα διευθέτησης χειμάρου.* (ΓΕΩΓΡ, ΓΕΩΔ, ΘΑΛ, ΠΕΡΙΒ, ΩΚΕΑΝ). (11) *Κυλιόμενη μάζα κατά τη θραύση κύματα.* Απόλυτο συνώνυμο του όρου αυτού είναι η έκφραση **roller of breaking waves** (ή **breakers**). (ΓΕΩΓΡ, ΓΕΩΔ, ΘΑΛ, ΠΕΡΙΒ, ΩΚΕΑΝ). (12) *Νησίδα μέσα σε ποταμό.* Συνώνυμο του όρου αυτού είναι η έκφραση **high bed**. (ΓΕΩΓΡ, ΓΕΩΔ, ΘΑΛ, ΠΕΡΙΒ, ΥΔΡΟΛ, ΩΚΕΑΝ). (13) *Ιζηματογενής ύφαλος, υποθαλάσσιος αναβαθμός.* Υπερύψωση του πυθμένα από συσσώρευση ιζημάτων. (ΓΕΩΓΡ, ΓΕΩΔ, ΘΑΛ, ΠΕΡΙΒ, ΩΚΕΑΝ). (14) *Πλευρά ματιού / βραγχίων* (στα ψάρια). (ΒΙΟΛ, ΘΑΛ, ΘΑΛΒΙΟΛ, ΠΕΡΙΒ, ΩΚΕΑΝ). (15) *Μονάδα μέτρησης bar, βαρίδα.* Μονάδα μέτρησης της πίεσης στο CGS σύστημα μονάδων μέτρησης. Ισχύει ότι 1 bar = 10^5Pa, όπου 1Pa (πασκάλ) είναι η μονάδα μέτρησης της πίεσης στο διεθνές σύστημα μονάδων (SI) και 1bar = 750mmHg, 1bar = 0,987 της ατμοσφαιρικής πίεσης. (ΓΕΩΓΡ, ΓΕΩΔ, ΜΕΤΕΩ, ΦΥΣ). (16) *Μπάρα πλεκτού υφάσματος.* (ΒΙΟΜ, ΚΛΩΣΤΥΦ). (17) *Ανάποδη ραφή.* (ΒΙΟΜ, ΚΛΩΣΤΥΦ).

Figure 1: Greek Polysemes of the English term **Bar**

If we observe the highlighted numbers 10-14 and the highlighted Greek abbreviations and English names of the specific domains – that is, ΘΑΛ [MARINE SCIENCES], ΠΕΡΙΒ [ENVIRONMENTAL SCIENCES] and ΩΚΕΑΝ [OCEANOGRAPHY] – in Figures 1 and 2 respectively, we realize that where in English only one term [i.e. 'bar'] is used,[13] in Greek four different terms or polysemes are used. What is much more striking is that this English term and its four different Greek terms (polysemes) are used in the same scientific domains. This is a notorious and extreme case of 'inter-

[13] Once again, it should be emphasized that the *italicized renderings in English* are a literal translation of the respective Greek terms. In English, only the term 'bar' is used in all these cases.

scientificity' for both English and non-English researchers for different reasons, which can cause either scientific misunderstandings or a total breakdown of scientific communication.

Bar: *Rod, ruler*. (a) Elongated short piece. (Generally, MATH, ENGINEERING). (b) *Ruler*, in Informatics. The absolute synonym of this term is the term **ruler**. (INFORMATICS). (2) *Bar of God / Gold bar*. (ECON, BANKING). (3) *"Chocolate"*. Marijuana in the form of a plate like a bar of chocolate. (4) *Streak*. (5) *Support*. The absolute synonym of this term is the term **stud**. (ENGINEERING) (6) *Blades, support beam*. (ENGINEERING). (7) *Traverse, binding*. The absolute synonym of this term is the term **truss**. (ENGINEERING). (8) *Steel bar* (ENGINEERING, CHEMISTY). (9) *Grating* (BIOLOGY, MEDICINE). (10) *Torrential dam*. (GEOGRAPHY, GEODESY, MARINE SCIENCES, ENVIRONMENTAL SCIENCES, OCEANOGRAPHY). (11) *Rolling mass during breaking waves*. The absolute synonym of this term is the expression roller of **breaking waves** (or **breakers**). (GEOGRAPHY, GEODESY, MARINE SCIENCES, ENVIRONMENTAL SCIENCES, OCEANOGRAPHY). (12) *Islet in a river*. Synonymous with this term is the expression **high bed**. (GEOGRAPHY, GEODESY, MARINE SCIENCES, ENVIRONMENTAL SCIENCES, HYDROLOGY, OCEANOGRAPHY). (13) *Sedimentary reef, underwater elevation*. Raising of the bottom due to accumulation of sediments. (GEOGRAPHY, GEODESY, MARINE SCIENCES, ENVIRONMENTAL SCIENCES, OCEANOGRAPHY). (14) *Side of eye / gills (in fish)*. (BIOLOGY, MARINE SCIENCES, MARINE BIOLOGY, ENVIROMENTAL SCIENCES, OCEANOGRAPHY). (15) *Unit of measurement bar, weight*. Unit of pressure measurement in the CGS system of units of measurement. It is valid that 1 bar = 105Pa, where 1Pa (pascal) is the unit of pressure measurement in the International System of Units (SI) and 1bar = 750mmHg, 1bar = 0.987 of atmospheric pressure. (GEOGRAPHY, GEODESY, METEOROLOGY, PHYSICS). (16) *Knitted fabric* bar. (INDUSTRY, TEXTILE INDUSTRY). (17) Upside down seam. (INDUSTRY, TEXTILE INDUSTRY).

Figure 2: English Literal Translation of Figure 1.

On the one hand, when English researchers in the above four different but interrelated domains – that is, Marine Sciences, Environmental Studies and Oceanography – try to communicate their research using the term 'bar', their English public must listen to or read the rest of the (spoken) text in order to understand what the specific researcher means in the given situation. In other words, there will be some moments of **uncertainty** (**indeterminacy** in linguistics) as to what the researcher (or a presenter/speaker or a writer) means.

On the other hand, when a non-English researcher tries to communicate his/her research to an international public will encounter the same difficulty as an English researcher will. However, it is when a non-English (within the present context, a Greek) researcher of one of the above domains tries to communicate with other Greek researchers the English term 'bar' but s/he is not '**aware**' (*noesis - νόησις*) of the fact this term can be rendered in four

different terms in Greek depending on the scientific context, then s/he may use the wrong Greek term thus confusing his/her Greek public and even creating a total scientific breakdown of communication.[14] In this case, it is applicable what is said: "we speak the same language but we don't understand each other" or "It's all Greek to them", although they are Greeks!

3.2.3. An example of reverse inter-scientificity [Greek: English]: 'Reverse inter-scientificity' occurs when a non-English researcher tries to translate a term of his/her mother tongue (**local**; Greek in the present study) into the **global** language (i.e. English) of scientific communication and s/he is not '*aware*' (*noesis - νόησις*) of the existence of different terms in English for different scientific contexts. If it so, then s/he runs the risk of using the wrong term thus leading to misunderstanding and/or to the total breakdown of scientific communication. From a translation point of view, 'reverse inter-scientificity' usually occurs when the SL (Source Language) term is a *faux ami* or a *false friend* (Mounin, 1974: 139)[15] with the TL (Target Language) term or the non-English research ignores the linguistic, domain-specific and cultural context of the English term.

A very good example of 'reverse inter-scientificity' is the Greek term πρόγραμμα (Figure 3), whose general use and its English equivalents in Informatics, Computer Science and Education confuse and tantalizes both Greek researchers and educators, when presenting their research in an international conference whose working language is English.

(1) 'Programme' or 'program' (Figure 3, 1) instead of 'Timetable' (Figure 3, 2), when they want to use the word in its daily routine at the University [in its general sense].

(2) 'Programme' or 'program' (Figure 3, 1) instead of 'Program' (Figure 3, 3), when they want to use the term for a computer program [in Informatics and/or Computer Science]; this mistake is made primarily by researchers (*noes*) who are in the Departments of Geography, Cultural

[14] This situation actually occurred when a Greek researcher tried to present an English scientific article in Greek when she defended her Ph.D. dissertation and when she made a presentation in a conference held in Greece and the language of communication was Greek.

[15] *Faux amis* or *false friends* are considered to be a word or expression in one language that, because it resembles one in another language, is often wrongly taken to have the same meaning.

Technology and Communication and Marine Sciences because these Departments deal with inter-disciplinary and trans-disciplinary domains that use Informatics, Programming, GIS (: Geographical Information Systems) and Remote Sensing.

Πρόγραμμα: (1) *Programme* (UK) or *Program* (US); (2) *Plan* (scheme) or *schedule* (*timetable*) [in its general sense]; (3) *Program* (UK and US), as in a computer program [in Informatics and Computer Science]; (4) *Programme* (or *Program*), as in Undergraduate or Postgraduate Studies Programme (or Program) [in Higher Education]; (5) *Curriculum*, as in a school curriculum or national curriculum [that is usually specified by the Ministry of Education – in Primary and Secondary Education]; (6) *Syllabus*, as a plan showing what is to be studied in particular course or subject that leads to an exam [in Primary, Secondary and Higher Education].

Figure 3: English Polysemes of Πρόγραμμα.

The author of the paper, as a freelance translator and English language editor, has observed that most Greek researchers have repeatedly been mistaken in transferring the Greek term 'πρόγραμμα' into English when writing, by using:

(3) 'Programme' or 'program' (Figure 3, 1) instead of 'Curriculum' (Figure 3, 5), when they refer to school curriculum that is specified by the Greek Ministry of Education [in Education]; this mistake is made primarily by researchers and educators (*noes*) of the Departments of Education, Geography, Sociology and Social Anthropology and History, because they offer some special courses that provide their students with teaching license and allow them to legally work as a Geography, Sociology and History teacher in the Greek Primary and Secondary Education System.

(4) 'Programme' or 'program' (Figure 3, 1) instead of 'Syllabus' (Figure 3, 6), when they discuss about what the students have to study for their exams [in Education]; this mistake is made by all researchers and educators (*noes*) of all the aforementioned Departments.

As it becomes conspicuous, this erroneous use of the Greek term 'πρόγραμμα' in English leads to a total breakdown of communication with English speakers. Greek researchers and educators' (or *noes*') difficulty in

using the right English polyseme lies primarily in two different parameters. First, they translate literally the Greek term πρόγραμμα into the English term programme (and/or program), since the latter cognates from the former – and, thus both terms can be considered *faux amis* or *false friends* (Mounin, 1974: 139), as discussed above and in footnote 15. Second, they seem ignore the linguistic, specialized and cultural context of the English term, as shown in Figure 3. The only case where the Greek researchers do not make a mistake when transferring the Greek term 'πρόγραμμα' into Programme (or Program) in writing is when using it as in Figure 3, 4, where the use in both languages is identical.

The ability of the Greek researchers and educators (*noes*) to identify which meaning 'πρόγραμμα' acquires in a specialized (con)text and which is the appropriate equivalent English term they should use while writing a paper in English is an issue of 'reverse inter-scientificity'.

4. Interface of HI (*nous*) and AI (computer) vis-à-vis 'inter-scientificity' and 'reverse inter-scientificity' within an international context of scientific communication

Having discussed about the challenges that non-English researchers face when trying to communicate their inter-disciplinary research to an international public, we come to realize that there is <u>much at stake</u> in international scientific communication when concepts like 'inter-scientificity' (e.g. 'bar' – Figures 1 and 2) and 'reverse inter-scientificity' (e.g. 'πρόγραμμα' – Figure 3) are not known (lack of knowledge or *epistēmē* - *ἐπιστήμη*) or even worse they are known but are totally ignored.

As discussed in 3.2., if both English and non-English researchers (especially the latter) are totally 'un*aware*' (lack of knowledge or *epistēmē* - *ἐπιστήμη*) of concepts such as 'inter-scientificity' and 'reverse inter-scientificity' and the issues they raise in international scientific communication, they run the risk of being misunderstood or establishing <u>no</u> scientific communication within an international context.

What we would suggest in the following sub-sections is that English and non-English researchers should learn: (1) how to use AI, electronic dictionaries, CAT tools and corpora to their own advantage; (2) how to organize the knowledge (*epistēmē* - *ἐπιστήμη*) of the appropriate use of terminology they acquire in a monolingual and/or bilingual personal TDB (Terminological Data Bank); and (3) what criteria they can establish if they wish to communicate their inter-disciplinary research internationally.

4.1. Interface of HI (nous) and AI (computer) in compiling and constructing a bilingual TDB

As discussed in section 3 of the present study, there are many electronic dictionaries, CAT tools and corpora that come to help of a non-English researcher. The issue is that s/he should, first, become '*aware*' (*noesis* - *νόησις*) of their existence and, then, learn how to use them – something that is not so difficult, even if s/he makes mistakes at the beginning; the author's motto to her students has been "We learn by making mistakes!"

Then, once the non-English researcher (HI – *nous*) gets familiarized with the use of these tools (AI – computer), s/he (HI – *nous*) should store the knowledge (*epistēmē* - *ἐπιστήμη*) acquired – that is, how to create a TDB - in a software program, such as Word (AI – computer), in order not to forget this knowledge and be able to retrieve easily whenever s/he wishes. The author of the present study has published extensively on how to compile, construct and maintain a bilingual TDB (Nikolarea, 2003a and b; 2004a and b; and 2005). Among these publications, the bilingual (English and Greek) publication in *Translatum* (Nikolarea, 2003a and b) is easy to follow and can be applied to any pair of languages and scientific discourses. To understand how useful and practical this translation tool is, it should be noted that Figure 1 in 3.2.2 in the present study is taken from the author's personal "Bilingual TDB for Geography and related Sciences", which she has been compiling it for the last twenty years, and she is ready to have it published.

Therefore, we can see how AI in the form of electronic dictionaries, CAT tools, corpora and/or an electronic TDB can help an English and non-English researcher - that is, HI – *nous* – to store, retrieve and use the

knowledge (*epistēmē* - *ἐπιστήμη*) acquired whenever s/he needs it. In this train of thought, it becomes only too obvious that AI is not just a tool for HI (*nous*) but rather it helps him/her to acquire knowledge (*epistēmē* - *ἐπιστήμη*) which the researcher [HI (*nous*)] can further advance it. In this sense, when there is an interface between HI (*nous*) and AI (computer) there is an overt and/or covert constructive complementarity and interdependency between these two poles of knowledge (*epistēmē* - *ἐπιστήμη*), as discussed in 2.3.

4.2. Establishing criteria for the achievement of international (scientific) communication

Nevertheless and despite the fact that there are very good electronic dictionaries, like IATE (in 3.1.), and machine translation (MT) engines – that is, neuro-based engines (in 3.1.2.) – which are programmed to understand the context of what is translated in order to provide the appropriate term choice, still it is the researcher (HI – *nous*) who has to establish the selection criteria for the use of the appropriate term in a given scientific context, because only a healthy HI – *nous* has the ability – if/when trained properly – to do this. It is only HI – *nous* – being '*aware*' (*noesis* – *νόησις*) of the issues that 'inter-scientificity' and 'reverse inter-scientificity' raise – can choose the "right" term, after s/he has gone through different rigorous mental/cognitive processes (*noesis* – *νόησις*) considering the specific scientific context. Only through '*awareness*' (*noesis* – *νόησις*) of what is at stake with the issues that 'inter-scientificity' and 'reverse inter-scientificity' raise – and only through different rigorous mental/cognitive processes (*noesis* – *νόησις*), with the aid of AI (computer),[16] a non-English researcher (HI – *nous*) can communicate his/her inter-disciplinary research and the knowledge (*epistēmē* - *ἐπιστήμη*) derived from it to other researchers (His – *noes*) in an international scientific context where knowledge (*epistēmē* - *ἐπιστήμη*) is [supposedly][17] further advanced.

[16] In two of her recent studies (Nikolarea, 2017 and 2019a), the author (HI – *nous*) describes at a meta-cognitive level these rigorous cognitive processes, explaining how AI (i.e. various electronic dictionaries and search engines) helped her to solve creatively a terminological problem.

[17] We have inserted 'supposedly' in brackets to denote that when knowledge (*epistēmē* - *ἐπιστήμη*) is separated from virtue and ethics, it becomes destructive or what Plato claims in *Menexenus* (246e 7-a 2): "πᾶσά *τε* ***ἐπιστήμη*** *χωριζομένη δικαιοσύνης καὶ τῆς ἄλλης ἀρετῆς* ***πανουργία****,* ***οὐ σοφία*** *φαίνεται*" or "every form of knowledge (*epistēmē* - *ἐπιστήμη*), when separated from justice and

5. Interface of HI (*nous*) and AI (computer) vis-à-vis 'inter-scientificity' and 'reverse inter-scientificity' within a HEIs (Higher Education Institutions) context

Given the multi-leveled complexity of the interface of HI (*nous*) and AI (computer) in inter-disciplinary research within an international scientific context, the author would propose that HEIs in North America (with a large number of international students and scholars) and HEIs in Europe that have established or are to establish international programs in English should, first, become "**aware**" (*noesis - νόησις*) of the concepts of 'inter-scientificity' and 'reverse inter-scientificity' and, then, educate and/or train their administrative and academic staff (HIs – *noes*) in those concepts, how to use AI and the tools it provides (e.g. electronic dictionaries, CAT tools, corpora) and how to compile and store their knowledge (*epistēmē - ἐπιστήμη*) acquired in a monolingual and/or bilingual TDB so that they can achieve an appropriate and effective scientific communication by advancing further their knowledge (*epistēmē - ἐπιστήμη*) of their domain of specialization.

5.1. Use of all tools that AI (computer) can provide

By being trained to use the various AI tools, a non-English researcher (HI – *nous*) can develop in at least two linguistic systems and academic discourses:

a. very advanced analytical skills;
b. comparative and contrastive skills;
c. very advanced synthetic skills; and
d. an understanding of the mechanisms of 'inter-scientificity' and 'reverse inter-scientificity'

This training can be provided only by trained translation scholars and practitioners and bilingual lexicographers. It can also help a non-English

---

the rest of virtue looks like wile rather than wisdom (*sofia -σοφία*). The author of this study both made the translation and inserted the ***emphases*** in the ancient Greek text.

researcher (HI – *nous*) develop uncertainty and stress tolerance for unknown terminology, and be patient and persistent when carrying out his/her own research.

5.2. TDB – A mnemonic device as a knowledge management tool

As we discussed earlier, the importance of this translation tool (AI - computer) is multileveled and the gains for a non-English researcher (HI – *nous*) are both short- and long-term ones. In a nutshell, a bilingual (or multilingual) TDB in an electronic form is a mnemonic device and/or a knowledge (*epistēmē* - *ἐπιστήμη*) management tool which helps a non-English researcher (HI – *nous*) who should move between at least two linguistic educational environments to: (1) develop and enhance his/her research skills and another kind of computer literacy; (2) become inter-scientific and intercultural competent; (3) acquire a research tool for life, thus becoming an independent learner in an international scientific environment; and (4) is one of the best manifestations of how complementarity and interdependency of HI (*nous*) and AI (computer) work through the interface of these two intelligences.

5.3. Population's awareness and development of inter-scientificity

As discussed in another paper more thoroughly (Nikolarea, 2006, 2019b), it is the inter-disciplinarity of certain sciences that give birth to 'inter-scientificity' and 'reverse inter-scientificity', since an inter-disciplinary field usually draws upon different disciplines and thus its terms, when re-contextualized, usually assume a totally different meaning from their initial one. It is this interface between inter-disciplinarity and 'inter-scientificity' that lends polysemy a multi-levelled understanding of specialized terminology and specialized discourse and makes them difficult to be understood not only by a general and specialized population but even by professional translators.

Therefore, general and specialized population at HEIs – that is administrative and academic staff as well as students (HIs – *noes*) of HEIs, who operate or wish to operate in an international scientific environment, should first become '*aware*' (*noesis* - *νόησις*) of, then be trained in the

polysemy of scientific terminology, and, then gradually will be able to reach such level of understanding of specialized_discourse in two linguistic systems (i.e. in English and in their mother tongue) so that they can use it appropriately and accurately across disciplines, languages and cultures.
Training in 'inter-scientificity' and 'reverse inter-scientificity' requires an inter-disciplinary and multidisciplinary approach, which can equip the parties involved [i.e. administrative and academic staff and students (HIs – *noes*)] of HEIs with the necessary skills and help them to:

- become learners of any new learning situation and environment;
- develop uncertainty and stress tolerance for unknown terms;
- motivate themselves to explore and take the risks involved in concepts and practice of 'inter-scientificity' and 'reverse inter-scientificity' in order to achieve an effective international communication; and to
- become fully '**aware**' (*noesis* - *νόησις*) that AI can complement them (HIs – *noes*) by providing the knowledge they need, and there will always be interdependency between them (HIs – *noes*) and AI (computer) if they want to advance their knowledge (*epistēmē* - *ἐπιστήμη*) in their own scientific field (*epistēmē* - *ἐπιστήμη*).[18]

6. Acknowledgements

I would like to thank the peer-editor of the final version of the present study Professor Elias Kourliouros (ekourliouros@upatras.gr) in the Department of Economics, School of Economics and Business, University of Patras (Rio 26504, Patras, Greece) for reading and commenting upon this paper. I would also thank Professor George Korres (gkorres@aegean.gr) in the Department of Geography, School of Social Sciences, University of the Aegean (Lesvos, Greece) who, as a non-anonymous peer reviewer, has helped me to enhance the present study.

[18] Both in Ancient and Modern Greek *epistēmē* - *ἐπιστήμη* is not only the body of scientific knowledge acquired but also the scientific field (or discipline) that one serves.

References

EuroDicAutom. Once available at: http://europa.eu.int/eurodicautom/login.jsp; it has ceased to exist.

IATE. Available at: https://iate.europa.eu/search/standard/result/byUrl/1

Kanaroglou, P., Nikolarea, E., Anomeritou, S. (2021). English-Greek Glossary of Spatial Statistics. In K. Kalabokidis, G. Korres, N. Soulakellis and Ch. Feidas (Eds.), *Social Sciences and Geography: Theory, Methods and Techniques of Spatial Statistics. In Memoriam of Pavlos Kanaroglou* (pp. 9-52). Mytilene (Lesvos, Greece): Department of Geography, University of the Aegean. Apart from the English-Greek Glossary of Spatial Statistics, which is in English and Greek, the rest of the publication is in Greek.

Linghub. Available at: https://lingohub.com/blog/2018/11/find-good-machine-translation-engines

Linguee. Available at: https://www.linguee.com/english-greek/translation/corpora.html

Maginot, Chr. (2015). Untranslatable Text: Myth, Reality or Something else? A Translator's Reflections on Translation and "Untranslatability". *ATA Chronicle* (May): 19-23.

Monolingual corpora. Available at: (1) https://guides.lib.umich.edu/c.php?g=282869&p=1884909 (for English); (2) https://www.greek-language.gr/greekLang/modern_greek/bibliographies/corpora/index.html (for Greek);

Mounin, G. (Ed.). (1974), *Dictionnaire de la linguistique*. Paris: Presses universitaires de France and in «Quadrige» n° 153, 1993.

Multilingual corpora. Available at: https://aclweb.org/aclwiki/Multilingual_Corpora

Nikolarea, E. (2020). A description and an implementation of an eclectic approach to ESP and EAP teaching at non-English Universities: A Greek case study. *Asian ESP Journal 16*(3), pp. 116-158.

Nikolarea, E. (2019a). Cognitive Problem Solving tools in a *glocalized* academic environment – Two Case Studies in a non-English academic context. *13th International Multi-Conference on Society, Cybernetics and Informatics (IMSCI 2019)* (pp. 26-32). (Vol. 1). Florida, USA.

Nikolarea, E. (2019b). Challenges in ESP/EAP Teaching at a Greek University: 'Inter-scientificity' in interdisciplinary fields. *Research Papers in Language Teaching and Learning 10*/1, pp. 427-440.

Nikolarea, E. (2017). Advanced translation research steps and tools used in ESP Teaching. In E. Agathopoulou, T. Danavassi and L. Efstathiadi (Eds). *Selected Papers on Theoretical and Applied Linguistics from ISTAL* (pp. 402-415). Vol 22. Thessaloniki, Greece.

Nikolarea, E. (2006). 'Inter-scientificity' in interdisciplinary fields, such as Geography: A case study of ESP at a Greek University. *ESP Across Cultures 3*, 66-77.

Nikolarea, E. (2005). Uses of the Internet in teaching English in a glocalised world. In F. Malpica, F. Welsch and A. Tremande (Eds.). *The 3rd International Conference on Education and Information Systems: Technologies and Application*s. *EISTA '05. Proceedings* (pp. 329-334). (Vol. II). Florida, USA: EISTA.

Nikolarea, E. (2004a). Translation Methods and Methodologies in ELT for Social Sciences Students. In M. Sidiropoulou and A. Papaconstantinou (Eds.). *Choice and Difference in Translation - The Specifics of Transfer*. (pp. 221-238). Athens, Greece: The National and Kapodistrian University of Athens.

Nikolarea, E. (2004b). ELT for Social Sciences students at non-English Universities. In R. Wilkinson (Ed.). *Meeting the challenge of multilingual higher education* (pp. 251-263). Maastricht, the Netherlands.

Nikolarea, E. (2003a). Creating a Bilingual Glossary for Translators." *Translatum Journal* (January). Available www.translatum.gr/journal/3/translator-glossary-en.htm (in *English*).

Nikolarea, E. (2003b). Creating a Bilingual Glossary for Translators. *Translatum Journal*. (January). Available at http://www.translatum.gr/journal/3/translator-glossary.htm (in *Modern Greek*).

Plato. *Menexenus*. 246e 247a Retrieved March 3, 2021, from http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.01.0179%3Atext%3DMenex.%3Asection%3D247a (in ancient Greek).

Pliny. *Natural History*. VI, 33, 211 Retrieved March 3, 2021, from http://penelope.uchicago.edu/Thayer/L/Roman/Texts/Pliny_the_Elder/6*.html (in Latin).
Poirier, P. (Nov, 17, 2017), "Four Human Strengths and AI Weaknesses." Retrieved January 3, 2021, from https://medium.com/eruditeai/four-human-strengths-and-ai-weaknesses-a0fc1d38d538
SDL Trados Studio 2021 (https://www.sdltrados.com/products/trados-studio/whats-new.html
Smartling. Available at: https://www.smartling.com/resources/101/state-of-machine-translation/
Terence. *Heauton timoroumenos*, 1.1, 75-77.
Virgil. *Georgics*. 2.407 Retrieved March 3, 2021, from http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.02.0059%3Abook%3D2%3Acard%3D397 (in Latin).