Arab World English Journal
INTERNATIONAL PEER REVIEWED JOURNAL ISSN: 2229-9327

Arab World English Journal (AWEJ) Special Issue on CALL Number 9. July 2023 Pp.122-134
DOI: https://dx.doi.org/10.24093/awej/call9.8

Online Asynchronous Learning English for Specific Purposes Terminology

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Received: 12/15/2022 Accepted:06/12/2023 Published: 07/24/2023

Abstract
The pandemic and military actions in the country triggered our study in considering the challenges Ukrainian higher education faces referring asynchronous learning. We assume that the challenges are threefold – namely - psychological, technical (availability of means for providing asynchronous communication and technological (scientifically grounded methods of quality asynchronous learning). In our study the focus is on the methods of asynchronous learning specialized terminology. The background of the research was the study of the literature concerning benefits and limitations of asynchronous learning and implementing online courses into the learning process. The purpose of this research was to prove the effectiveness of asynchronous learning specialized vocabulary with the help of the Moodle-based course. The aim was achieved by fulfilling the following tasks: literary review to study the benefits and limitations of asynchronous and synchronous learning for finding the most suitable mode of communication for the Ukrainian students, to design a Moodle-based course, to verify it in the experimental learning. The experiment was conducted in 2020 in the time of Covid-19 pandemic at the National Technical University of Ukraine, Igor Sikorsky Kyiv Polytechnic Institute, and involved seventy students of the Power Engineering Department. The research purpose of both the article and the experiment was to assess the effectiveness of the developed online simulator which included audio recordings of native English specialists' communication, interdisciplinary and industry-specific terminology, training tasks, and instructional guidelines. The outcome of the research proves the efficiency of applying an online simulator in the development of students' professional competence in terms of adequate using interdisciplinary and industry-specific terminology.

Keywords: English for Specific Purposes, industry-specific terminology, interdisciplinary terminology, mediation, online asynchronous learning, terminological competence

Cite as: Kolomiiets, S., Guryeyeva, L., & Kulieznova, S. (2023). Online Asynchronous Learning English for Specific Purposes Terminology. *Arab World English Journal (AWEJ) Special Issue on CALL (9*)122-13 . DOI: https://dx.doi.org/10.24093/awej/call9.8

Introduction

Education in Ukraine after the Covid-19 pandemic faces such extraordinary, even force majeure circumstances as the military actions throughout the country when most learners cannot continue their education in the classrooms. Such a situation requires the possibility of adjusting to the remote mode of education and predetermining the design of distance learning courses. This will enable learners to study effectively using online courses while staying at home or in a safe place. Therefore, we suggest the course for developing the terminological competence of students majoring in power engineering based on an online Moodle simulator.

The Common European Framework of Reference for Languages (CEFR, 2018) suggests the conceptual basis for the online course design specifying mediation as new strategy in learning foreign. Mediation occurs when there is an interconnection between various elements and spaces. Such a versatile interconnection may involve comprehension that is more efficient or evolving relations across boundaries and keeping away or sorting out conflict situations (Brian North, 2016), where the individual and the social aspects interrelate as the process of mediation combines the social and the individual elements (Swain, 2015). Considering the different aspects within the framework of which mediation is discussed in the CEFR (CEFR, 2018), we can outline four types of mediation: linguistic, cultural, social, and pedagogic as well as mediation of text, concept and communication Our study focuses on linguistic, or better to specify - cross-cultural mediation, which is closely connected to translation and interpreting.

The rapid integration of the Ukrainian educational system into the global community is significant. Furthermore, the accelerated development of the current state of science and technology suggests a significant number of information transmission means, and a mediator plays an essential role in this course of events. Therefore, the function of cross-cultural mediation in economic, social, political and scientific cooperation between different countries keeps growing fast. Especially considering the significant changes the whole world community is experiencing today. The edited descriptors of the Common European Framework of Reference for Languages mediation include spoken interpretation and written translation (Section four), focusing on the crucial role of this type of activity in education (CEFR, 2018).

The advantage of online learning platforms is the ease of their involvement in the learning process. Furthermore, integrating new technologies and the concept of micro-learning into the ESP Syllabi development of courses to merge independent students' work enables the application of blended learning technology. After all, the main goal of modern education is to achieve the optimal balance between these two elements within the continuum, which is between maximum flexibility and maximum quality or "value" for students (Norm Friesen, 2012). The learning platform is a set of resources, tools and interactive online services for teachers, students, and other participants in the educational process; it is designed to support and empower education and learning management.

If we consider the training platforms in terms of licensing, we can divide them into open-source and commercial platforms. The most common examples of open platforms are Moodle, GoSkills, TalentLMS, Sakai etc. Commercial platforms include Udemy, SkillShare, Blackboard, Desire2Learn and Pearson LearningStudio. Educators can use open-source platforms to copy, modify and distribute the developed online courses with minimal licensing restrictions. Another advantage is that the courses can also be developed using supplementing individual modules depending on the needs of students. However, commercial platforms are more secure and reliable.

Another essential aspect of teaching ESP students majoring in power engineering is the new role of Ukraine in the European energy market. The question of synchronization of the Ukrainian power system with the European Network of Transmission System Operators for Electricity (ENTSO-E), the association for the cooperation of the European transmission system operators (TSOs), has been considered since 2017 (European Association for Cooperation of Transmission System Operators (TSOs), 2022). Due to an urgent request by Ukraine for emergency synchronization, the TSOs of Continental Europe facilitated the accelerated synchronization process in March 2022. This project became possible due to the previous research and the adoption of risk mitigation measures conducted by the Ukrainian power-engineering specialists (National Power Company, 2022).

Considering the importance of this event and the international cooperation involved, the aspect of cross-cultural mediation between future power-engineering specialists and their European colleagues is of great significance.

It is also worth mentioning that ESP students majoring in engineering are highly motivated, as they understand their involvement in related professional activity. This fact stresses the importance of teaching professional terminology and developing terminological competence (Bakirova, 2021).

The research aims to justify the efficiency of the Moodle-based course for terminological competence development of ESP students majoring in power engineering at the National Technical University of Ukraine Igor Sikorsky Kyiv Polytechnic Institute. According to the main task of this study, the authors formulated the following tasks:

- to design a Moodle-based course,
- to formulate the corresponding system of exercises,
- to prepare and deliver an experiment, and finally,
- to process and analyse the obtained results.

The main research questions are what are the most effective methods for developing terminological competence among ESP students majoring in power engineering, and how does the development of terminological competence impact the academic and professional performance of ESP students majoring in power engineering?

Literature Review

Distinguishing benefits and limitations of asynchronous learning served as a prerequisite for our study. It is assumed that every distance or mobile learning process, where the tools of information and communication technology play a significant role, is called virtual or e-learning (Seresi 2016).

Study of asynchronous and synchronous e-learning methods discovered that each supports different purposes (Chaudhury, 2023). Synchronous learning increased reflection and ability and distance mode learning increased motivation to process information (Azar, 2023). Stefan Hrastinski claims that communication related to the course content is essential for learning (Hrastinski, 2008). There exist three types of exchange - content-related, planning of tasks, social support. Not only types of exchange but learning strategies should be considered in the developing learning courses. As Antonia Berecz states "…regardless of paradigm shift, it is true that the learning strategies are based on learning techniques chosen according to the learner's learning style(s)… teaching strategies are open systems; their application depends on the purpose and content of teaching" (Berecz, 2019, p. 10).

Learning strategies should be taken into account in facilitating asynchronous learning. Ways and methods to implement and facilitate asynchronous learning were suggested by Moorhouse,2021 ; (Riwayatiningsi & Sulistyani, 2020) ; (Seresi, 2021). In choosing the trend, the strategy for designing the course, we followed the idea suggested by Bertalan Komenczi: "According to their typology, three main trends can be distinguished in today's educational practice: the theoretical, qualitative approach ("the humanities approach"), the quantitative scientific method ("the science approach") and the research focusing on system development ("the engineering approach")" (Komenczi, 2013). In this study we mostly used the quantitative scientific method in justifying the validity of f the developed course.

An activity report by the UNESCO Institute for Information Technology in Education analyzed learning platforms' key issues and limitations. The main points are funding, internal resistance, user competence and intellectual property security (UNESCO Institute for Information Technologies in Education , 2012-2013). The open platforms allow for levelling out the funding issue. The problem of internal resistance on behalf of the teachers and students accustomed to conservative teaching methods is getting sorted out by external circumstances, such as the Coronavirus lockdown (Singh, 2021). The most crucial issue of user competence and security of intellectual property remains unsolved (Maussumbayev, 2022). T. Welzer (Welzer, 2018)suggests that technology-enhanced learning offers untapped opportunities for learners, allowing them to introduce resources to other institutions (Welzer, 2018). The students could adopt a blended learning strategy for their learning process (Alzahrani, 2023). Regarding the war conditions Ukrainian students experience these days, online courses left the only opportunity for them to continue their education.

Considering the importance of this event and the international cooperation involved, the aspect of cross-cultural mediation between future power-engineering specialists and their European colleagues is of great significance.

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Method

The applied methods used for the development of the Moodle-based course for the development of the terminological competence of power engineering students were as follows:

a) the educational process modeling under the conditions of online learning;

b) the analysis of modern scientific and pedagogical materials;

c) the usage of the mathematical statistics methods to process the obtained data;

d) delivery of anonymous surveys as the means of qualitative research to analyze students' and teachers' perceptions of the material (Ward, 2018); and

e) organization and experimental verification of the effectiveness of the developed methodology.

The *hypothesis* of the study was the assumption that the effective development of terminological competence of ESP students majoring in power engineering is possible using the online Moodle-based simulator.

Participants

The experiment was conducted at the National Technical University of Ukraine, Igor Sikorsky Kyiv Polytechnic Institute in 2020. The experiment involved seventy students of the power engineering department taking the last year of the bachelor's degree program. This number was calculated as optimum by applying the methods of mathematical statistics. In this case, the maximum permissible error did not exceed 3% (Gmurman, 2004). The developed simulator requires 20 hours of online learning.

Research Instruments

The power engineering and interdisciplinary terminology was a teaching material with an interdisciplinary focus on power engineering, ecology, physics, chemistry, and mathematics (1000 interdisciplinary and industry-specific terms and term collocations). The online simulator included audio recordings of native English specialists' communication, interdisciplinary and industry-specific terminology training tasks, and instructional guidelines. The designed course included three components.

The first-course component played a placement test, helping students check their knowledge level and develop their psychophysiological mechanisms (memory capacity, reaction speed, concentration, and listening skills). The criteria and scoring of the preparatory stage exercises are presented in Table one.

Table 1. *Preparatory non-contextual exercises*

	Tasks	Score/word	Number of words/task	Total score/ task
1.	Reaction time when choosing an equivalent	1	5	5
2.	Number of reproduced lexical and terminological units in a particular order	1	5	5
3.	Number of reproduced lexical and terminological units	1	5	5
4.	Number of reproduced lexical and terminological units after a specific time period (10-15 mins) (prolonged memorization)	1	5	5
	Total		20	20

The second component included exercises to develop students' terminological competence further to form their ability to mediate using interdisciplinary polysemantic and industry-specific terms. The training stage exercises types and scoring are presented in Table two.

Table 2. *Training micro-context exercises*

	Tasks	Score/unit	Number of units/task	Total score/ task
1.	Translation of polysemantic terms by the given field of science	1	5	5
2.	Translation of industry-specific terms	1	5	5

3.	Level of switching pace (Ukrainian to English / English to Ukrainian	1	5	5
4.	Development of terminological competence within the micro context	5	5	25
	Total		20	40

The third part of the course allowed the practice of cross-cultural mediation skills within the power-engineering domain presented in Table three.

Table 3. *Micro and macro-context exercises for cross-cultural mediation practice*

	Task	Score/unit	Number of tasks	Total score/ task
1.	Development of terminological competence in the micro and macro context	5	8	40
	Total	5	8	40

Further, we present the structure of the experimental studying in Table four (see Appendix A).

Research Procedures

The experiment procedure included training consisting of three stages: stage One - pre-experimental stage and organization of the experiment; stage Two – implementation of the experiment; stage Three – a final test and the obtained data processing and interpreting.

The authors focused on analyzing the effectiveness of the designed course based on interdisciplinary (chemistry, physics, ecology, and math terminology) and industry-specific terminology (power engineering). During the first stage, two experimental groups took part in a pre-test working with similar content. The tests helped identify the participants' results. *Figure one* shows that the students of both groups had approximately similar marks.

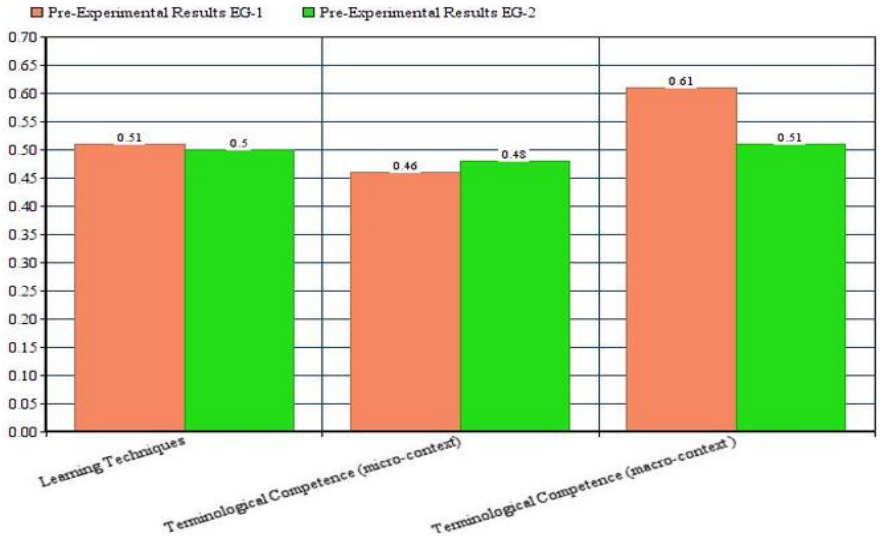

Figure 1. Pre-test results: EG1 – experimental group 1, EG2 - experimental group 2

The second stage of the experiment involved both groups of participants while developing their terminological competence in working with interdisciplinary and industry-specific terms. Two groups of participants had similar tasks; however, the first experimental group, EG1, was not restricted by performance time so that they could work at their own pace. On the other hand, the second EG2 group had time constraints to perform the tests imitating the negotiation process of power engineering specialists.

The third phase of the experiment was a post-experiment that allowed measuring the participants' efficiency and identifying the terminological competence development within the power engineering and interdisciplinary terminology of the overlapping scientific areas, including chemistry, ecology, mathematics, and physics. Finally, the authors assessed the effectiveness of the designed course and interpreted the results using the methods of mathematical statistics.

Results

The research purpose of both the article and the experiment was to assess the effectiveness of the developed online simulator for teaching ESP students majoring in power engineering and to conduct an experiment and interpret the obtained results.

As described above, the seventy ESP students of the power engineering department in the final year of the bachelor's degree program (the National Technical University of Ukraine Igor Sikorsky Kyiv Polytechnic Institute) participated in the experiment. Two experimental groups (EG1 and EG2) took part in the experiment to develop terminological competence using interdisciplinary terminology in chemistry, ecology, math, and physics and industry-specific terminology (power engineering). Both groups, EG1 and EG2, had similar tasks and were not limited in the number of attempts. However, EG2 was limited in time to perform the tasks imitating stressful conditions of actual negotiations involving power-engineering specialists. It should be noted that one of the critical challenges of online teaching is uncontrolled access to the Internet and translating techniques, which were the key challenges while delivering the tests (Monteiro, 2014). In this case, the time restriction for task performance helps address this issue.

The results showed that both groups had improved their performance (Figure two). If we compare the results shown in Figure one, it is quite clear that the participants of both groups showed higher scores. Moreover, the results of EG2 participants that had a time limit and, consequently, experienced more stress showed better results.

Figure 2. Post-experiment test results of group One and group Two

The comparison of Figures one and two suggests that the average score improved in both groups, proving the effectiveness and the need for integrating the online learning simulator applying interdisciplinary and industry-specific terminology for students majoring in power engineering.

Discussion

We see two directions while discussing the research results. The first aspect outlines the importance of developing the terminological competence of ESP students majoring in power engineering and considering the most effective methods for developing the competence, as mentioned earlier.

Discussing the first aspect, we would like to focus on the importance of the active involvement of power engineering students in cross-cultural mediation. The reason for this is a significant milestone for Ukraine within the context of the war and the accelerated synchronization to the European Transmission System Operators for Electricity (TSOs), leading to the collaboration with Ukraine under challenging circumstances (European Association for Cooperation of Transmission System Operators (TSOs), 2022). Furthermore, although the essential aim of ESP teaching is for students to acquire knowledge of industry-specific terminology and their basic concepts, it is rather challenging to teach the entire field-specific terminology (Hirsto, Enell-Nilsson, Kauppinen-Räisänen, & Keng, 2020). Therefore, developing students' terminological competence using interdisciplinary and industry-specific terminology helps to involve future power engineers in activities required to obtain industry-specific knowledge learning in such a way that the related scientific concepts behind the terminology.

It is worth mentioning that the mediation concept is multifaceted and, therefore, not entirely clear (Brian North, 2016). For this reason, Coste and Cavalli suggest a rather generic explanation of mediation, stating that the essence of the mediation process is to narrow the distance between the two elements, either distant from each other or in tension (Coste, 2015).

Regarding the second focus of the discussion, it seems reasonable to suggest that a Moodle simulator for developing terminological competence of power engineering students learning ESP can provide a significant number of tasks aimed at the abovementioned competence development. Online learning is an essential component of today's educational tendencies. It leads to an unavoidable shift of the traditional educational teacher-centred process perception (Kalay, 2020). An online simulator for power engineering studying ESP can compensate for the lack of classroom time.

The pre-experimental phase aimed to recognize the level of skills in listening, code-switching, psychophysiological mechanisms (memory capacity, reaction time, concentration abilities, etc.) (López, 2016), and the readiness to participate in the cross-cultural mediation process as a part of professional activity. The post-experimental test results were crucial to identifying the level of the development of terminological competence using interdisciplinary and industry-specific terminology. Both content and the criteria for results evaluation of the pre-and post-examination stage were similar to those of the experimental stage. Moodle's automated assessment system analysed the first two course parts. This system allowed almost all students' answers to be limited to "true/false" choices. Only the third part of the system required manual assessment.

Before the first stage of the experiment, the students had an introductory lecture in Zoom where the authors presented the critical concept of the online simulator and the detailed instructions. Afterwards, the students were thoroughly instructed on the course goals and informed about the time restrictions, activities involved, and the control and assessment process. The

Moodle platform assessment system allows checking not only student scores and progress in real-time mode. In addition, the instructor can check the student's progress statistics. Every experiment stage included students' Zoom meetings with the instructor to discuss the current course stage and be acquainted with the assignments' structure and types.

Regarding the fact that the online learning process covers students' independent work, the participants worked remotely, performing the tasks at their own pace by applying the most suitable electronic means (personal computers, laptops, tablets, or smartphones). Furthermore, the training mode by applying an online simulator enhances students' motivation to study. The current research results reveal that this time the experiment participants did not experience significant problems working with the online learning course due to the lack of experience as before (Kolomieets, 2018).

The outcome of the current research study reveals that the online simulator for ESP students majoring in power engineering improves not only the development of terminological competence within the context of interdisciplinary terminology (in the field of chemistry, ecology, mathematics, and physics in our case) and industry-specific (power engineering) terminology, but also enhances the critical thinking and problem-solving abilities.

Conclusion

Such factors as the Pandemic, military actions taking place in Ukraine, the rapid integration of the Ukrainian educational system into the global community and the growing function of cross-cultural mediation in economic, social, political and scientific cooperation between different countries suggest that modern teaching technologies and online learning modes, particularly have become essential elements of the latest educational tendencies in Ukraine. The research proved the online simulator efficiency in teaching power engineering students of the National Technical University of Ukraine Igor Sikorsky Kyiv Polytechnic Institute studying ESP. Following the critical study objectives, the Moodle-based course to develop terminological competence in power engineering was designed; the methodologically viable system of exercises was developed, and the authors conducted the experiment and interpreted the results. The participants were divided into two focus groups to participate in the described experiment. Both experimental groups received the exact instructions and had the same tasks. It is essential to mention that they were not limited in the number of attempts. The second group, however, had limited performance time for the series of tasks imitating the real-time cross-cultural mediation process. Such cooperation with the power-engineering specialists is usually conducted under stressful conditions. The results suggested that the participants of both groups developed their terminological competence in ESP within the scope of interdisciplinary and industry-specific terms improving their mediating skills; however, the second group that worked under stressful conditions proved higher efficiency.

The experiment participants were encouraged to get involved in teacher-guided and independent work within the Moodle-based platform, improving their critical thinking and analytical skills. Furthermore, the recent synchronization of the Ukrainian power system with the European Network of Transmission System Operators for Electricity (ENTSO-E) increased the importance of the training of ESP students majoring in power engineering who will be new players in the integrated energy market. Therefore, an integration of the online simulator suggests an efficiency increase. It also improves the quality of teaching power engineering students. It facilitates the further development of their competence using interdisciplinary and industry-specific terminology at their own pace, suggesting the future engineers' significant professional growth.

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APPENDIX

Table 4. *Structure of the experimental studying*

#	Task Name	Task Description	Score
Stage 1. The degree of educational technique mastering is tested:			
1.	Reaction time when choosing an equivalent	1 point per 5 words	5
2.	Number of reproduced lexical and terminological units in a particular order	1 point per 5 words	5
3.	Number of reproduced lexical and terminological units	1 point per 5 words	5
4.	Prolonged memorization: number of reproduced lexical and terminological units after a specific time period	1 point per 5 words	5
		Total	20
Stage 2. Terminological competence development is tested:			
5.	Translation of polysemantic terms by the given field of science	1 point per 5 words	5
6.	Industry-specific terms translation	1 point per 5 words	5
7.	Level of switching pace (Ukrainian to English / English to Ukrainian	1 point per 5 words (the point is scored if managed to do the task within a particular time)	5
8.	Development of terminological competence within the micro context	5 points per 5 words	25
		Total	40
Stage 3. Terminological competence development and mediation process:			
9.	Terminological competence development in micro and macro context	5 points per 8 tasks	40
		Total	100