

IMPACT OF TECHNOLOGY ON SPEAKING AND WRITING SKILLS OF MASTERS IN ENGINEERING ESP LEARNING

Olha Chaikovska¹, Iryna Semenyshyna¹, Oxana Muliarchuk¹, Iryna Koval²

¹Podillia State University, Ukraine; ²Khmelnyskyi National University, Ukraine
olgachaikovskaya@ukr.net, isemenisina@gmail.com, oksankarom777@gmail.com, iryna-
koval@ukr.net

Abstract. Dissatisfaction of Ukrainian employers with the FL performance of engineers in the workplace reveals the gap between ESP university instructions and the expectations of employers. This gap provides opportunities for additional research to examine materials and technology that can benefit engineering student performance in Business English for Specific Purposes course which shares the characteristics with General English, English for Specific Purposes, Business English and is considered the most difficult ESP subset both for teaching and learning. In this paper, we investigate the influence of engineering podcasts chosen through needs analysis and online technical writing materials on students' speaking and writing skills in a profession-based context. To be more specific, we examined which of the two sub-skills was acquired with better progress. This study followed two groups of Masters majoring in Agricultural Engineering and Electrical Engineering and Energy ($n = 115$) in Ukraine through 2020/21. To design the course, we conveyed a two-phase questionnaire to examine engineering students' opinions on the necessity of acquiring four basic skills and sub-skills. After having integrated English podcasts for engineers by Olivia Augustin, the engineering career coach podcasts and technical writing videos with the experimental group both groups were tested at the end of the course. To assess the statistical difference between the groups Pearson criterion in Excel was used. The research results showed that students highlighted speaking and writing skills as the main challenges. Technical writing skills were enhanced by using technology in Business English for Engineering Purposes classroom. The experiment has demonstrated that there is no significant difference in improving speaking skills in the control and experimental groups. Further research should consider other effective strategies for improving students' speaking performance in Business English for Engineering Purposes.

Keywords: Business English, engineering, podcasts, technical writing, speaking skills, writing skills.

Introduction

The students enrolled in the engineering Master's degree, have a two-credit ESP course, titled Business English. The ESP course for bachelor students in the Higher Education Institution Podillia State University in Ukraine is oriented toward engineering needs, while the Business English course for Master students offers skills for academic needs.

We have a unified syllabus for all Master students that contains general Business English topics such as the role of science in the development of society, international cooperation, social and cultural norms of business communication, job search and documentation. However, Business English courses should differ according to the major and prepare the students for business communication in a profession-based context. Consequently, the course design that does not meet engineering student needs in business communication causes the gap between EFL proficiency of Ukrainian engineers compared to engineers in other countries. To address these weaknesses Business English for specific purposes should be redesigned to enhance the employability of engineering graduates. To make the appropriate changes several steps should be done. Firstly, the experience in the field of Business English for specific purposes of teaching and the course design should be examined. Secondly, the Master's in engineering needs analyses should be done in the local context. After designing the course considering the recommendations of language instructors the efficacy of applying a new course should be tested experimentally.

English for Business Purposes (EBP) has recently become a very relevant and vast field within English for Specific Purposes, both as regards teaching and research. Various experimental studies have been conducted on Business English for Specific purposes among engineering students, basically in the Asian educational environment [1-5]. These studies have consistently found that an engineer also needs soft or professional skills such as interpersonal and communicative skills [6] that are critical in engineering practice. Differing definitions and lack of empirical evidence make it difficult to help students develop these skills. [7]. Significant studies have also been completed on designing Business English for Specific Purposes courses for engineering students [1; 4].

Indonesian [8] and Bangladesh [1] scientists suggest that instructors should consult different Internet sources that can enrich lessons [8], provide with authentic and up-to-date materials from websites like business letters, dialogues, instructions, telephone conversations, podcasts, vodcasts, etc. [1].

Noteworthy, there is an expanding body of publications on identifying engineering student needs analysis from the point of view of engineering students, ESP instructors, and stakeholders. Most researchers agree that needs analysis is considered to be the main driving factor in ESP curriculum development [1; 2; 9-11]. Indonesian Mechanical Engineering students, for example, perceive that listening is the most important skill for them followed by speaking, reading, and writing [9]. According to findings of Turkish scientists, the most important language skill is reading and the least important is speaking, showing a high contrast with ESL [6]. Hossain J. states that improvement of writing and speaking skills is very urgent for engineering students in Bangladesh [1]. The scholars emphasize that all four basic language skills [11] are to be considered when designing the course. The literature review revealed that there is no single approach based on engineering student needs analysis to designing the Business English course for Specific purposes. As it could be seen, engineering student needs differ even within Asian countries. So, it is desirable to conduct such surveys in the local context because engineering student needs depend on the language skills of the faculty members and the type of ESP course (it can be the preparatory course for engineering students, Master course). A literature review on Business English for Specific Purposes course also showed that foreign scholars insist on using web-based materials. Despite this, the issue of effective teaching and learning Business English for Engineering Purposes through online resources and digital tools has not been researched yet.

In this paper, we have tried to estimate the effects of English for engineering podcasts by Olivia Augustine, the engineering career coach podcasts and Technical Writer HQ YouTube videos on Master student speaking proficiency and writing skills. The findings of our research could be significant for Master's engineering education programs. It will help engineers meet the requirements of the workplace. This study answers the following research questions: What EFL skills are considered to be the most important for engineering Master students? Which speaking and writing instructions do they consider the most helpful ones in Business English for Engineering Purposes setting? Do engineering podcasts and technical writing videos improve engineering Master student speaking and writing skills?

Materials and methods

A mixed research design was used in the present study. Qualitative research was employed to gain data about the engineering student attitudes toward the most challenging skills and sub-skills. For that purpose, a closed-ended questionnaire was suggested to the participants. The quantitative research method was employed to assess the level of Business English speaking and writing skills in a profession-based context using the Pearson criterion. The calculation was made in Excel.

The study involved 115 Master students majoring in Agricultural Engineering and Electrical Engineering and Energy who were studying at the Higher Education Institution Podillia State University and volunteered to participate in this research. The participants took part in the survey during the 2020-2021 academic years.

Four stages were used in this study. The subjects were divided into the experimental (61 Master students majoring in Agrarian Engineering) and control groups (54 Master students majoring in Electrical Engineering and Energy) to obtain the objective of the research. The research was designed based on recommendations [8] for teaching Business English to Mechanical engineers. Firstly, the researcher highlighted the importance of assessing the level of students' foreign language competence. We did not test the current level of English proficiency at the beginning of the course, because all of the bachelor students passed the unified entrance exam to join the Master course. They all are B2 foreign language users. During the first stage, we found out what our students wanted to achieve by analysing the engineering students' needs in relevant research studies. Secondly, based on the needs analysis we designed a questionnaire for the engineering students to measure the most challenging foreign language skill and sub-skills consequently. Such collaboration had to keep the students "engaged and motivated throughout the course" [8]. During the first stage of the questionnaire, we found out which of the four basic skills are challenging for the students. During the second phase of the questionnaire, the students

were given speaking and writing sub-skills determined by the educational Master's student programme to choose the most important sub-skills for engineering Master students.

Then we planned Business English classes for Engineering Master students according to the data obtained from the questionnaire. Due to the university syllabus, the Master students had a two-credit mandatory ESP course (2 academic hours a week). Both groups had an equal number of ESP classes. The experimental period lasted for five months (one semester). Both groups had completely online study due to quarantine concerning pandemic Covid19. A general Business course was designed due to ECTS in the Moodle Learning Management System. The control group students had classes based completely on Moodle course, while the students of the experimental group had classes with the integration of English for engineering podcasts by Olivia Augustine [12] and the engineering career coach podcast [13]. We covered the following topics from Business vs Technical English, Well, hello there (Olivia introduces herself and tells you a little bit about her background in engineering), Business English for business engineers (STEM, engineering, international projects, Technical English, Business English and Business Communication), Top questions engineer should ask at their next performance review, Top skills all engineers need to excel in for their careers, the lost art of effective one-on-one meetings, Practical problem-solving skills for engineering needs, Developing soft skills for a successful career in engineering [13]. The guide on using profession-based podcasts was designed in previous studies. The data from the research results proved the efficacy of using engineering podcasts in the ESP classroom [14]. So, we did not provide additional instructions on learning ESP through professional podcasts. Technical writing skills with the Master students were mastered through Technical Writer HQ YouTube videos. At the end of the semester, both groups did the post-test comprised of two sections: speaking and writing. In the speaking section, the students worked in pairs and were asked to speak on the proposed by the teacher topic: to make business phone calls, make a presentation, promote a product, to pass a job interview. The writing section was focused on technical writing documentation. The students wrote one of the technical engineering documents: e-mail, CV, proposal, memo. The total score for each section is five. The pre-experiment questionnaire aimed at identifying Engineering Master student needs analysis concerning four basic skills and sub-skills. To compare the improvements in speaking and writing skills the efficiency of podcasts and technical writing video resources, consequently, the statistical significance test was applied. To calculate the obtained data the statistical program Excel was used.

Results and discussion

The pre-test questionnaire was held in the first semester to provide the language instructors with time for preparing "authentic, up-to-date and relevant for the students' specializations materials" [8, p. 148]. The results of the first phase of the questionnaire are given in Fig. 1.

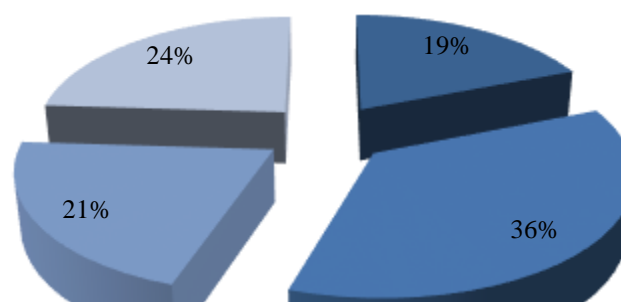


Fig. 1. Most challenging EFL skills for Masters in engineering

It is clear from the graph that the majority of participants want to improve their speaking (36%) and writing skills (24%) in a profession-based context. It should be noted that 21% of students highlighted the importance of developing listening skills. We believe that engineering podcast activities will also help improve the students' listening skills and further research will focus on creating podcasts for testing listening skills in a professional context. Rating the reading skills as less challenging for engineering students is explained by the fact that the students passed the exam to join the Master's course and it was

focused on reading. So, they know the reading strategies and proved their test-taking skills during the unified entrance exam. The second phase of the interview aimed at identifying the speaking and writing skills that need improvement. The results are given in Fig.2 and Fig. 3.

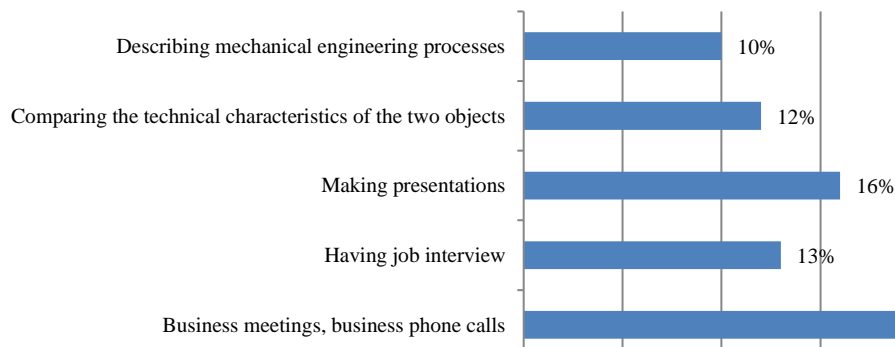


Fig. 2. Speaking sub-skills

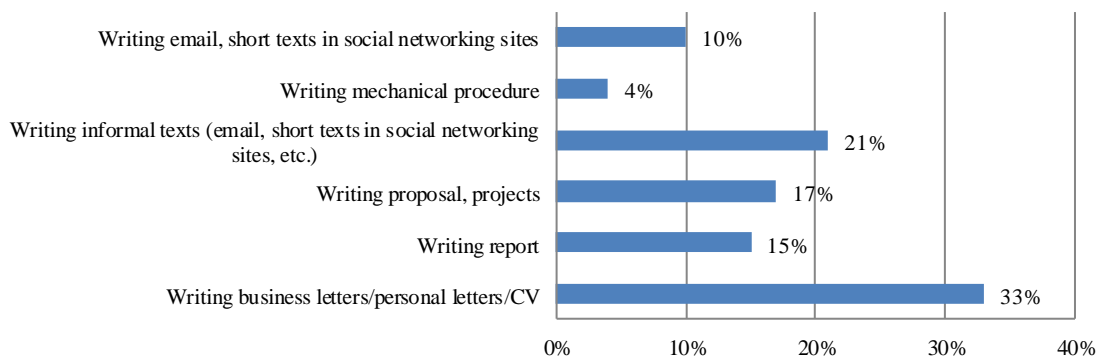


Fig. 3. Writing sub-skills

According to the results of the questionnaire, the students asserted that communicating during business meetings, having phone calls, asking and answering questions in a professional context and making presentations are among the most important sub-skills for the engineering students. As for writing, sub-skills are concerned with writing business letters, CVs, informal texts and proposals are indicated as the most important for students. To get the final results the obtained data from the final tests were analysed. Since we had two groups of participants with a different number of subjects in each and the study aimed at comparing the students' progress within two skills (speaking and writing), the Pearson criterion was used. The data from the final tests were calculated with the help of Excel. The details of the results are displayed in Fig.4.

	A	B	C	D	E	F	G	H	I
1		score	n/c	n/exp	f/c	f/exp.	$n/c-n/exp:xp)^2/(n/c+n/exp)$		
2		2	3	1	0,055556	0,016393	4	0,000383418	
3		3	19	11	0,351852	0,180328	30	0,000980683	
4		4	19	31	0,351852	0,508197	50	0,000488874	
5		5	13	18	0,240741	0,295082	31	9,52571E-05	
6			54	61	1	1	115	0,001948232	
7		2	1	0	0,018519	0	1	0,000342936	
8		3	13	10	0,240741	0,163934	23	0,000256487	
9		4	25	16	0,462963	0,262295	41	0,000982137	
10		5	15	35	0,277778	0,57377	50	0,001752234	
11			54	61	1	1	115	0,003333793	
12									
13	Speaking				6,417475				
14	Writing				10,98151				
15	g=4								
16	v=3	v = g - 1							
17	p < 0,05								
18									
19	x2cr=7,815								
20	Speaking		H0 is accepted						
21	Writing		H1 is accepted						

Fig. 4. Descriptive statistics of the groups in the final test

In the Pearson criterion statistical hypothesis test a null hypothesis and an alternative hypothesis were proposed for the probability distribution of the data H_0 : there is no significant difference in improving speaking and writing skills in the control and experimental groups (in other words: possible differences are due to random factors and are not statistically significant). H_1 : there is a significant difference in improving speaking and writing skills in the control and experimental groups. Due to a given number of gradations ($g = 4$), the number of degrees of freedom is $\nu = 3$; for significance $\rho \leq 0.05$ χ_{cr}^2 is 7.815. Therefore, concerning the assimilation of the theory, the H_0 hypothesis is accepted; with the improvement of speaking skills. H_1 is accepted in terms of improving writing skills in a profession-based context.

It is undeniable that many countries are struggling to improve engineers' ESP competencies. The overwhelming majority of scientists from the Asian learning environment state that engineering education fails to meet the profession-based requirements of the Business English for Engineering Purposes course [1;4-6; 8; 9; 11]. The results of their study showed that engineering student attitude towards the most important foreign language skills differs. The engineering Master students' needs analysis at the Ukrainian Technical University showed that the results are in line with the research from Hossain and Kaewpet [1; 1]. The university students from Bangladesh and Thailand also consider speaking and writing skills most helpful. The results of our detailed questionnaire in our experiment underline the need for Masters in Engineering to provide business communication in an engineering context and write technical documentation. Most research publications on teaching Business English for Specific purposes focus primarily on learning strategies and approaches [1, 8], foreign language needs of engineering students in Iran, Indonesia, China [5; 4; 9] and expectations of well-reputed companies [5; 6]. In line with some studies [1; 8] that recommended using Internet resources in Business English for Engineering Purposes teaching, we provided a deeper analysis of the efficacy of particular technology such as engineering podcasts and technical writing videos in improving speaking and writing skills. The students' results in both groups were processed and analysed statistically using the Pearson criterion. However, the research results were unexpected. We hoped that using the mentioned above technology will lead to better students' performance in both speaking and writing. The research results demonstrated the improvement only in writing skills with the students of the experimental group. However, there was no statistically significant difference in improving speaking skills after using engineering podcasts during the Business English for Engineering Purposes course. The absence of better student performance with the experimental class in terms of speaking skills can be explained, to our mind, by several facts: a limited number of academic hours for Business English for Engineering Purposes, a large number of engineering podcasts (the number of profession-based podcasts should be reduced by half), difficult podcast-based activities and equal distribution of the training time for developing speaking and writing skills. Taking into consideration the mentioned above weaknesses, we think that easier podcast-based activities should be designed, in-class activities should be focused on developing speaking skills, while technical writing videos and tasks based on them should be given as a home assignment.

Conclusions

The findings of the study reveal important issues regarding the utility of the Business for Engineering Purposes course with the Masers in engineering. First of all, engineering education in Ukraine will benefit from teaching Business English for Engineering Purposes in line with stakeholders' requirements represented in the basic educational engineering programme and student needs analysis provided by ESP language instructors in the local context. The results of the present study revealed that Masters in engineering consider speaking and writing as the most useful and important skills. Notably, engineering students want to manage business communication within the context of engineering and to improve business correspondence skills in the engineering field. Secondly, the integration of technical writing YouTube videos can benefit Masters in engineering technical writing skills.

Author contributions

Conceptualization, O. Chaikovska; methodology, O. Chaikovska and I. Koval; software, I. Semenyshyna; formal analysis, I. Semenyshyna and O. Muliarchuk.; investigation, O. Chaikovska, I. Semenyshyna, O. Muliarchuk and I. Koval; data curation, O. Muliarchuk; writing – original draft

preparation, O. Chaikovska and O. Muliarchuk; writing – review and editing, O. Chaikovska; visualization, I. Semenyshyna. All authors have read and agreed to the published version of the manuscript.

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