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# Engineering students' use of technical literature in English and attitudes towards ESP

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Considering the rapid development of science and technology and the fact that a vast majority of scientific and professional papers are published in English, it is necessary to be proficient in English in order to be able to keep abreast of the most recent developments in the field. The aim of this study was to gain insight into how much the students of the Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, Croatia, use technical literature in English (TLE) for study purposes and whether TLE use is related to students' attitudes to English for specific purposes (ESP) in three contexts: university study, professional development, and career advancement. The study was conducted using an online survey created by the authors. The participants were 533 Engineering students (394 male and 139 female) from all years of study. The results showed that students use TLE rarely to moderately. Curricular requirements appear to be the strongest factor leading to TLE use, while positive attitudes towards the importance of ESP proficiency and ESP proficiency itself seem to be facilitating factors for more frequent TLE use.

Keywords: *English for Specific Purposes, technical literature in English, students' attitudes*

## 1. INTRODUCTION

One of the key elements that facilitates the learning of a foreign language (FL) and a language for specific purposes (LSP) is motivation, which is strongly related to the learner's attitude towards the language. The high value of being able to use LSP competently in the professional world makes the importance of LSP education at the tertiary level even more apparent. The objectives of teaching LSP at the Faculty of Mechanical Engineering and Naval Architecture (FMENA) at the University of Zagreb are to develop the skills of reading and understanding technical texts; finding and understanding relevant technical information; writing summaries; presenting projects, products, technical and technological processes; and written and oral communication skills in academic and professional discourse. Students are expected to acquire the basic terminology of their respective professional fields, the grammatical structure of technical English, as well as other features of academic and professional language.

In terms of English for specific purposes (ESP), the course aims to enable students to use the language, to acquire and convey technical and content-specific information, but the proficiency they ultimately achieve will largely depend on practice, that is, on their actual use of professional reading in English for technical subjects over the course of their studies. The frequency with which students use professional sources in English may depend on several factors: the requirements of the teacher (or curriculum), their English proficiency, their motivation to learn the language, their attitude towards ESP, their motivation to expand the scope of the sources, and so on.

Considering the rapid development of science and technology and the fact that a vast majority of scientific and professional papers are published in English, ESP proficiency is necessary for keeping abreast of the most recent developments in the field. The focus of the study reported in this paper was the relationship between frequency of use of technical literature in English (TLE) by students at the Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, and their attitudes towards the importance of ESP in the context of three different purposes: study, professional development, and career advancement.

## **2. THEORETICAL BACKGROUND**

### **2.1. Language for specific purposes**

Teaching ESP is a student-centred approach that involves content-specific language and refers to teaching a specific type of language that has a specific learning objective or area of instruction (Bošnjak Terzić, 2018). General FL learning and LSP learning share the same characteristics of foreign language learning, but there are also some differences. The difference lies, among other things, in the learners' goals in learning a foreign language, and in the materials that are developed for LSP learners, which are specific to a particular context and based on the learners' needs. It is generally accepted that LSP, as well as ESP teaching, is based on students' needs and reasons for learning the language (Hutchinson & Waters, 1987; Dudley-Evans, 2001; Richards & Rodgers, 2001; Belcher, 2009). In addition, LSP focuses on the use of specific features that characterise a particular domain. The most striking difference is in terminology, as LSP encompasses both language knowledge and content knowledge specific to a particular context. Kereković (2012) states that the basic characteristic of professional language is its pragmatism - it must fulfil its practical function and is used for specific purposes and in specific situations.

Summarizing the above, we can say that LSP aims to meet the specific needs and reasons for learning the language needed to achieve certain goals. From the student's perspective, one of the immediate goals is to pass exams in various professional subjects. In turn, these subjects prepare the student for future employment and competitiveness on the labour market, while proficiency in ESP adds to the potential for labour mobility and career advancement. However, the quality of LSP teaching is only one of the factors which affect success in learning a language for specific purposes. It has been well established that the role of motivation as well as attitudes is also highly important in the process.

### **2.2. Motivation and attitudes in language learning**

Language learning motivation is a complex construct that entails attitudes towards learning, learning goals, and motivated behaviour (effort, choice, and persistence) (Csizér et al., 2010). According to Dörnyei (1994, p. 487), one of the most important elements in the acquisition of FL knowledge is the motivational complex, which consists of at least 3 independent levels: the language level, the learner level, and the learning situation. The language level includes, among other things, the learner's attitude towards

the target language and its speakers, and it plays a crucial role in language learning. Baker (1992, p. 11) considers attitude as a “fundamental concept of social psychology varying from religion, sports, race, language”, adding that language is “an important explanatory variable” to attitude. Furthermore, Baker (p. 12) suggests that attitudes can be both “input” and “output” where an attitude as an input is the source element in triggering positive or negative action towards an object, e.g. a favourable attitude to language or mathematics can lead to good achievements in these target objects. On the other hand, attitudes can be an output where an attitude is a result or of an experience – e.g., learners may develop a positive attitude towards “reading” after attending a reading program. In the context of English as a second or foreign language, research has demonstrated the importance of attitude and motivation in the learning situation (Elyazale, 2019).

For almost a century, attitude has been studied as a psychological construct from cognitive, affective, neuroscientific, and many other aspects, and scrutinized from the perspective of many human faculties, language being one of them. Revisiting the essential nature of the concept of attitudes, Petty et al. (1997, p. 611) state that the core of attitude definition is “the notion of evaluation”, and Crano and Prislin (2006, p. 347) remark that “attitude represents an evaluative integration of cognitions and affects experienced in relation to an object and that they are “evaluative judgments that integrate and summarize these cognitive/affective reactions”. They further conclude that the strength of attitudes has implications for behaviour.

Research on the attitudes of students in non-English-speaking countries towards English and motivation for English language (EL) learning often reports positive attitudes towards the English language, English language learning, the social value and educational status of the English language, and English-speaking culture, while at the same time, integrative reasons for learning English are the least important, and instrumental and utilitarian reasons for EL learning dominate (Tahaine & Daana, 2013; Al-Tamimi & Shuib, 2009; Bobkina & Calyea, 2012).

A variety of internal and external factors influence the formation of evaluative judgments, i.e., attitudes. Some studies have reported statistically significant results where females have more positive attitudes towards ESP or English as a foreign language (EFL) learning than males (Aldosari, 2014; Martinović & Poljaković, 2010), others find males to have more positive attitudes than females (Soleimani & Hanafi, 2013; Penjak & Karninčić, 2015), and finally, some studies have found no gender-based difference in attitudes (Asghar et al., 2018; Elyazale, 2019; Malekmahmudi & Malekmahmudi, 2018).

The reasons for such diverse findings may lie in cultural, economic, political, psychological, or other factors. The gender aspect was observed in this study, however only at the phenomenological level, without deeper analysis.

### **2.3. The Croatian context**

Croatian youth are highly exposed to general English, among other things, through TV (Croatian TV channels use subtitles for programs in foreign languages), through video streaming services like Netflix or Prime Video, and through popular music that is predominantly in English. However, the situation is different when it comes to ESP. They encounter it predominantly at the tertiary level of education and only rarely in secondary level.

There has been considerable emigration of young highly educated people from Croatia in recent years, which is an important economic, political, and demographic issue (Troskot et al., 2019). As English is the *lingua franca* in the fields of science, technology, and business, English language skills facilitate global economic migration as well as labour migration in the EU labour market. It is therefore to be expected that Croatian students will see English language skills as important for their career, especially if they want to pursue a career abroad. A positive attitude towards the English language, as well as the intention to work abroad, might also be reflected in learning activities during one's studies, which include reading professional literature in English for the purpose of studying. To our knowledge, the only study on the frequency of use of English-language professional literature (ELPL) was conducted by Hodak (2022) with students at the Faculty of Health Sciences in Rijeka. Most of the students used ELPL frequently. The reasons for this are not conclusive, but it seems that they might be partly related to curricular requirements.

One of the aims of the ESP courses at FMENA is to enable students to use professional literature in English for their studies, as this is the most accessible source of authentic professional and academic discourse in English during their studies. Blažević and Bošnjak Terzić (2017) state that specific sources are crucial for quality education, since technical ESP deals with very specific content that is subject to rapid change and development. It can be expected that more frequent and purposeful use (in this case to pass exams) of English-language professional literature may increase students' ESP competence, giving them access to up-to-date knowledge in their field of study and expanding their options in future career choices. The synergistic effect of learning technical English (TE) and reading authentic English-language technical literature can have a positive impact on students'

self-assessed proficiency, their confidence in communicating in English, etc.

An insight into the frequency of use of English-language professional literature for study purposes could also be an indicator of the necessity or profitability of translations in certain fields and/or subjects. The question arises as to the volume and selection of specialised literature that needs to be translated in a given period of time in order to keep up with developments, whether for study purposes or for professional development.

### **3. THE STUDY**

#### **3.1. Aim and hypotheses**

The aims of the study were as follows:

- 1) to observe the frequency of students' use of technical literature in English (TLE)
- 2) to determine whether students distinguish between general English (GE) and ESP, as this was a prerequisite for studying their attitudes towards ESP
- 3) to observe students' attitudes towards the importance of proficiency in ESP in three different contexts: 1. university study; 2. professional development; and 3. career advancement.

Both frequency of TLE use and attitudes were also analysed in terms of their relationship or correlations with the year of study, self-assessed proficiency in ESP and intended country of work. In addition, the frequency of TLE use was analysed in terms of its correlation with the final grade in the TE course, and attitudes from the perspective of gender and intended field of work.

The hypotheses were as follows:

1. The frequency of TLE use will be positively correlated with self-assessed ESP proficiency, TE course grade, year of study and intended country of work.
2. GE and ESP will be recognized as distinct categories
3. Positive attitudes towards ESP will be rated significantly higher in students who plan to work abroad, while there will be no statistically significant differences in attitudes towards the importance of ESP between groups in relation to gender or intended field of work.
4. Positive attitudes towards ESP will be significantly positively correlated with the student's self-assessed ESP proficiency, year of study, and the frequency of TLE use.

## 4. METHOD

### 4.1. Instrument and data collection

After obtaining approval from the Vice Dean for Education to conduct the research by sending the questionnaire via e-mail to all the students from the Faculty of Mechanical Engineering and Naval Architecture, data for this study were collected between 20 March and 1 April 2022, at which time students were starting their 2<sup>nd</sup>, 4<sup>th</sup>, 6<sup>th</sup>, 8<sup>th</sup>, or 10<sup>th</sup> semester. The authors created a questionnaire consisting of 31 questions, of which 20 were analysed in this study, collecting the following data:

- a) socio-demographic (gender, age, type of finished high school, chosen major at university, year of study),
- b) FL (years of learning English, TE course grade - mean value of 8 mid-term exam grades obtained during four semesters),
- c) self-assessment of GE and ESP at two points in time: before they started studying (GE-b, ESP-b) and at the time of taking the questionnaire, i.e. Now (GE-n, ESP-n). (The assessment was made on a five-point scale, with 1 being the lowest and 5 the highest score. This scale was used because it reflects the grading scale commonly used in the Croatian education system and may be the most intuitive for Croatian students). The questions were formulated and presented as follows:
  - *How would you grade your knowledge of GENERAL English language BEFORE ENROLMENT at university?*
  - *How would you grade your knowledge of TECHNICAL ENGLISH BEFORE ENROLMENT at university?*
  - *How would you grade your knowledge of GENERAL English language AT THE PRESENT MOMENT?*
  - *How would you grade your knowledge of TECHNICAL ENGLISH AT THE PRESENT MOMENT?*
- d) attitudes (the importance of ESP in three different contexts: university study, professional development, and career advancement). The assessment was made on a five-point scale (1 – not at all important, 2, 3, 4, 5 – highly important), and the questions were formulated and presented as follows:
  - *In your opinion, how important is it to know technical English for STUDY PURPOSES in your major?*
  - *In your opinion, how important is it in your profession to know technical English for the purpose of PROFESSIONAL DEVELOPMENT?*
  - *In your opinion, how important is it in your profession to know technical English for the purpose of CAREER ADVANCEMENT?*

and

- e) TLE use (frequency of use and the need for TLE). The questions were rated on a five-point scale from “never” to “always”, and formulated and presented as follows:
- *How often do you use technical literature in the English language for study purposes?*
  - *To what degree do you need technical literature in English for study purposes?*

The questionnaire was administered online via the FreeOnlineSurveys.com online survey tool, and the participation in the study was voluntary and anonymous. The questionnaire was based on the one used by the author of this study in a previous study on the same topic (Hodak, 2022) at the Faculty of Health Sciences, University of Rijeka. The data analysis was performed using JASP (Jeffreys’s Amazing Statistics Program) Version 0.16.2, a free and open-source program for statistical analysis supported by the University of Amsterdam.

#### **4.2. Participants**

The research was conducted at the Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, among all students from the 1<sup>st</sup> to the 5<sup>th</sup> year of study. The participants were 533 students aged 18–28 years (*mean* = 21.3); 74% were male ( $N = 394$ ), 78% ( $N = 418$ ) had previously graduated from grammar school and 22% ( $N = 115$ ) from vocational school. The distribution by year of study is quite uniform: 22% of the participants were first-year students ( $N = 117$ ); 28% ( $N = 147$ ) were second-year students; 22% ( $N = 116$ ) were third-year students; 18% ( $N = 94$ ) were fourth-year students; and 11% ( $N = 59$ ) were fifth-year students.

In Croatia, children are usually enrolled in school at age 7. After 8 years of elementary education, students continue their education either in a vocational school program or in a grammar school program. English is taught as an obligatory subject throughout elementary and secondary school, so that by age 18 a student will typically have studied English for a total of 12 years. Participants in this study had studied English for an average of 11.5 years ( $SD = 1.267$ ) prior to tertiary education. The majority of participants (85%,  $N = 453$ ) did not learn ESP in high school.

## 5. RESULTS

### 5.1. Students' use of technical literature in English

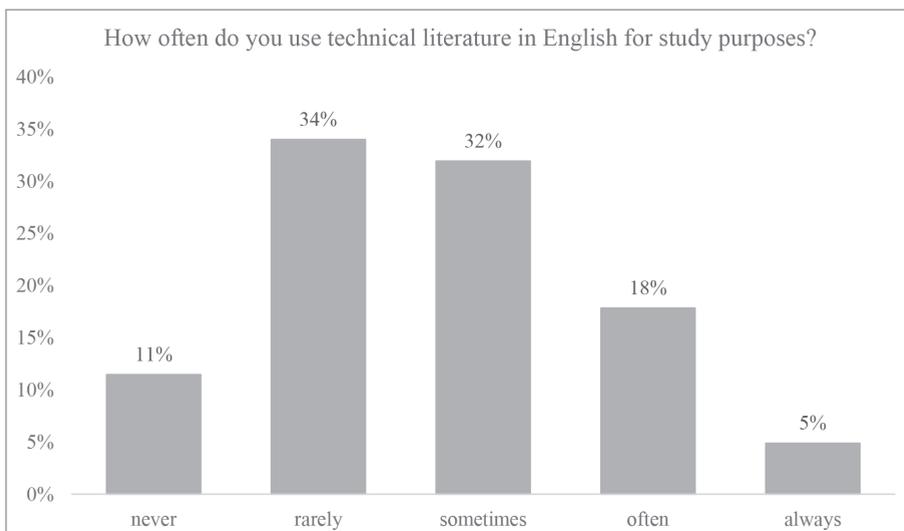
The results showed that 11% ( $N = 61$ ) of the students never use TLE; 34% ( $N = 181$ ) rarely; 32% ( $N = 170$ ) sometimes; 18% ( $N = 95$ ) often; and 5% ( $N = 26$ ) indicated that they always use TLE for study purposes (Figure 1).

**Figure 1.**

*Frequency of using technical literature in English (TLE) for study purposes*

**Slika 1.**

*Učestalost korištenja stručne literature na engleskom jeziku za potrebe studiranja*



It was hypothesized that specific factors have a positive effect on the frequency of TLE use: year of study, intended country of work, TE course grade, and self-assessed ESP. The hypothesis was confirmed for all the factors apart from intended country of work, which did not prove to have an effect on TLE use.

The frequency of TLE use seems to increase with the year of study. Correlation analysis showed a statistically significant positive correlation between the frequency of TLE use and the year of study ( $\rho = .313$ ;  $p < .001$ ). To see whether this positive correlation was influenced by external factors or intrinsically motivated, the students' perception of the need for TLE was also examined and assessed on a five-point scale (not at all, to a small degree, moderately, to a great degree, necessary).

Although a significant positive correlation was also found between the students' perceived need for TLE and their year of study ( $\rho = .299$ ;  $p <$

.001), the estimated frequency of use was lower than the estimated need for TLE. A comparison of students' estimates of the need for TLE for study and frequency of TLE use showed that on average, the estimated need for TLE for study was higher ( $M = 2.89$ ) than the reported actual use of TLE ( $M = 2.71$ ). The Wilcoxon Signed-Rank Test indicates that this difference is statistically significant ( $T = 5984.00$ ;  $z = -5.95$ ,  $p < .001$ ). It is likely that the rise in frequency of TLE use with the year of study is due to mandatory reading in course syllabi rather than students' own decision to use study resources in the English language.

The frequency of TLE use was also analysed in relation to the students' plans for the country where they would like to pursue their career: in Croatia or abroad. The third group consisted of the undecided students. The Kruskal Wallis H-test did not reveal a statistically significant difference in the frequency of TLE use between the groups divided by intended country of work.

Correlation between the grade obtained in the TE course and the frequency of TLE use was also analysed, but only for the fourth- and fifth-year students ( $N = 153$ ), since only this group had completed the TE course. A weak statistically significant positive correlation was found between frequency of TLE use and the final grade in Technical English ( $rho .199$ ,  $p = .014$ ). A stronger, albeit moderate correlation, was found in the same sample for self-assessed ESP proficiency ( $rho .341$ ,  $p < .001$ ). During the second and third year of study, students take midterm exams. No correlation was found between frequency of TLE use and the second- and third-year students' midterm grades (Table 1).

**Table 1.**

*Correlation between Frequency of use of technical literature in English (TLE) and: grade obtained on the final exam (FE) of the Technical English course, grade obtained on midterm exams (ME) of the Technical English course, and self-assessed ESP proficiency*

**Tablica 1.**

*Korelacija između učestalosti korištenja stručne literature na engleskom jeziku i: ocjene dobivene na ispitu kolegija Tehnički engleski jezik, ocjene dobivene na kolokviju kolegija Tehnički engleski jezik i samoprocijenjenog poznavanja engleskog jezika struke*

Variable	FE grade		ME grade		Self-assessed ESP proficiency	
	4 <sup>th</sup> and 5 <sup>th</sup> -year students		2 <sup>nd</sup> - and 3 <sup>rd</sup> -year students		4 <sup>th</sup> - and 5 <sup>th</sup> -year students	
Frequency of TLE	<i>rho</i>	.199 *	.084	.341	***	
use	<i>p</i>	.014	.176	< .001		

Spearman's Correlations: *rho* – correlation coefficient, *p* – level of significance (\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ )

In the sample of the fourth- and fifth-year students, a statistically significant moderate positive correlation was found between the TE course final grade and self-assessed ESP proficiency ( $\rho = .34, p < .001$ ).

## 5.2. Self-assessment of GE and ESP

In order to enrol at the Faculty, students must pass General English (GE) on the State Matura (the National Secondary School Leaving Exam in Croatia) with a minimum level corresponding to A2 level of the Common European Framework of Reference for Languages. Against this background, teachers are confronted with classes of students who have different prior education and English language proficiency, attitudes and habits towards learning a foreign language. The mandatory ESP course (i.e., the Technical English course) is introduced in the third semester and focuses equally on the linguistic aspect of the technical language and on specific language skills that future engineers will need in the modern professional environment. The course is mandatory for all students from the third through the sixth semester. At the time this study was conducted, all participants, with the exception of first-year students, had already had contact with professional English through the TE course for at least one semester and should have been able to distinguish between general English (GE) and technical English (i.e., English for Specific Purposes - ESP).

Since the questions on attitudes refer specifically to ESP, a prerequisite for their correct interpretation is knowledge of the difference between GE and ESP. To determine whether students recognised GE and ESP as different categories, self-assessment (SA) of GE and ESP before enrolment at the university and at the time of taking the questionnaire was analysed. As the data was skewed, a Wilcoxon Signed-Rank test was used for the analyses, which produced some statistically significant results. The test revealed no statistically significant difference in self-assessed GE proficiency for two time points: before entering university (SA-GE-b) and at the time of completing the survey (SA-GE-n) (Table 2).

**Table 2.**

*Difference in self-assessed general English proficiency at two time points: before enrolment at the university (SA-GE-b) and at the time of completing the survey, i.e., 'now' (SA-GE-n)*

**Tablica 2.**

*Razlika u samoprocjeni znanja općeg engleskog jezika prije upisa na fakultet i u trenutku ispunjavanja ankete*

	<b>M</b>	<b>SD</b>	<b>Z</b>	<b>p</b>
<b>SA-GE-n</b>	4.12	.80	1.56	< .119
<b>SA-GE-b</b>	4.08	.86		

*M* – mean, *SD* – standard deviation, *Z* - Wilcoxon Signed-Rank Test, *p* – statistical significance (\* -  $p < .05$ , \*\* -  $p < .01$ , \*\*\* -  $p < .001$ )

Unlike GE, a statistically significant difference was found in self-assessed proficiency of ESP for two time points: before entering university (SA-GE-b) and at the time of completing the survey (SA-GE-n), with SA-ESP-n scores being statistically significantly higher than SA-ESP-b scores (Table 3).

**Table 3.**

*Difference in self-assessed proficiency in English for Specific Purposes at two time points: before enrolment at the university (SA-ESP-b) and at the time of completing the survey, i.e., 'now' (SA-ESP-n)*

**Tablica 3.**

*Razlika u samoprocjeni znanja engleskog jezika struke prije upisa na fakultet i u trenutku ispunjavanja ankete*

	<b>M</b>	<b>SD</b>	<b>Z</b>	<b>p</b>
<b>SA-ESP-n</b>	3.34	.94	13.74	< .000***
<b>SA-ESP-b</b>	2.65	1.07		

*M* – mean, *SD* – standard deviation, *Z* - Wilcoxon Signed-Rank Test, *p* – statistical significance (\* -  $p < .05$ , \*\* -  $p < .01$ , \*\*\* -  $p < .001$ )

A statistically significant difference was also found between self-assessed proficiency of GE before entering university (SA-GE-b) and ESP before entering university (SA-ESP-b), where students rated their GE proficiency as better than their ESP proficiency (Table 4).

**Table 4.**

*Difference in self-assessed proficiency in English for specific purposes (SA-ESP-b) and general English (SA-GE-b) before enrolment at the university*

**Tablica 4.**

*Razlika u samoprocjeni znanja engleskog jezika struke i općeg engleskog jezika prije upisa na fakultet*

	<b>M</b>	<b>SD</b>	<b>Z</b>	<b>p</b>
<b>SA-ESP-b</b>	2.65	1.07	-18.13	< .000***
<b>SA-GE-b</b>	4.08	.86		

*M* – mean, *SD* – standard deviation, *Z* - Wilcoxon Signed-Rank Test, *p* – statistical significance (\* -  $p < .05$ , \*\* -  $p < .01$ , \*\*\* -  $p < .001$ )

A Wilcoxon Signed-Rank Test revealed statistically significant results between self-assessed proficiency of GE at the time of completing the survey, i.e. ‘now’ (SA-GE-n) and ESP at the time of completing the survey (SA-ESP-n), where students estimated their GE proficiency as better than their ESP proficiency (Table 4).

**Table 5.**

*Difference in self-assessed proficiency in English for specific purposes (SA-ESP-n) and general English (SA-GE-n) at the time of completing the survey*

**Tablica 5.**

*Razlika u samoprocjeni znanja engleskog jezika struke i općeg engleskog jezika u trenutku ispunjavanja ankete*

	<b>M</b>	<b>SD</b>	<b>Z</b>	<b>p</b>
<b>SA-ESP-n</b>	3.34	.94	-15.59	< .000***
<b>SA-GE-n</b>	4.12	.80		

*M* – mean, *SD* – standard deviation, *Z* - Wilcoxon Signed-Rank Test, *p* – statistical significance (\* - *p* < .05, \*\* - *p* < .01, \*\*\* - *p* < .001)

The difference between the scores (ranging from 1 to 5) of self-assessed proficiency in both GE (SA-GE-d) and ESP (SA-ESP-d) was calculated by subtracting the score of self-assessed knowledge at the time of completing the survey from the value of the self-assessed knowledge before entering university (e.g., SA-ESP-n minus SA-ESP-b). A Wilcoxon Signed-Rank Test showed that the difference of self-assessed ESP (SA-ESP-d) scores were statistically significantly higher than the difference of self-assessed GE (SA-GE-d) scores (Table 6). It seems that the students subjectively assess their improvement in ESP proficiency between the two time points as greater than improvement in GE proficiency.

**Table 6.**

*Difference in self-assessment of change in proficiency between the two points in time (before entering university and at the time of completing the survey) for English for specific purposes (SA-ESP-d) and general English (SA-GE-d)*

**Tablica 6.**

*Razlike u samoprocjeni promjene u znanju engleskog jezika struke i općeg engleskog jezika između dviju točaka u vremenu (prije upisa na fakultet i u trenutku ispunjavanja ankete)*

	<b>M</b>	<b>SD</b>	<b>Z</b>	<b>p</b>
<b>SA-ESP-d</b>	.69	.92	13.18	< .000***
<b>SA-GE-d</b>	.04	.51		

*M* – mean, *SD* – standard deviation, *Z* - Wilcoxon Signed-Rank Test, *p* – statistical significance (\* - *p* < .05, \*\* - *p* < .01, \*\*\* - *p* < .001)

These results suggest that students distinguish between GE and ESP, and feel that their knowledge of ESP rather than GE has improved over the period indicated.

### 5.3. Students' attitudes towards the importance of ESP

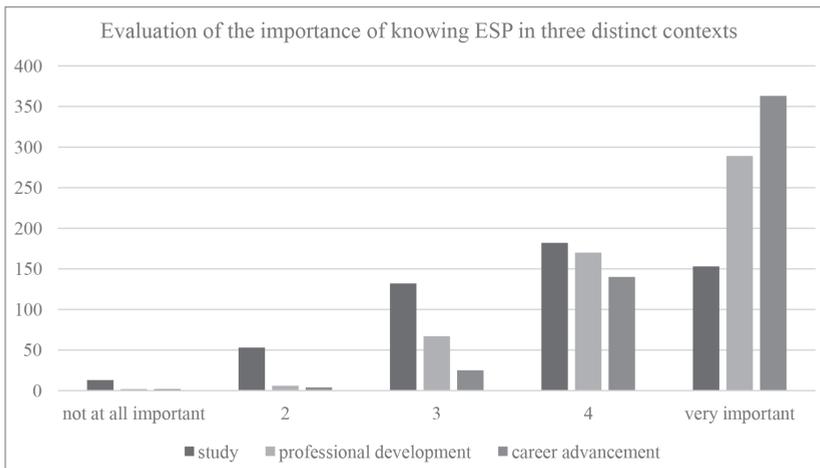
Students' attitudes towards the importance of ESP were observed for three different contexts: university study, professional development, and career advancement. Overall, students expressed a strong positive attitude towards the importance of knowing ESP in all three contexts with the strongest positive attitude in the context of career advancement, where 68% ( $N = 363$ ) gave the highest rating, and the weakest was in the context of study where the highest rating was given by only 29% ( $N = 153$ ) of the students (Figure 2).

**Figure 2.**

*Evaluation of the importance of ESP in three contexts: 1) university study, 2) professional development, and 3) career advancement*

**Slika 2.**

*Ocjena važnosti poznavanja engleskog jezika struke u tri konteksta: 1) studiranje, 2) stručno usavršavanje i 3) napredovanje u karijeri*



For each of the three contexts, non-parametric tests were conducted to examine differences between independent participant groups divided by: gender, intended country of employment, and intended career field.

The Mann-Whitney U Test showed a statistically significant difference in attitudes towards the importance of knowing ESP between groups of respondents divided by gender, with female respondents assessing ESP as more important than male respondents in all three contexts: study, professional development and career advancement (Table 7).

**Table 7.**

*Mann-Whitney U Test of the differences between groups divided by gender regarding the attitudes towards the importance of knowing ESP in three contexts: studying, professional development, and career advancement*

**Tablica 7.**

*Mann-Whitneyev U Test Razlika između grupa podijeljenih po stavovima prema važnosti poznavanja engleskog jezika struke u tri konteksta: 1) studiranje, 2) stručno usavršavanje i 3) napredovanje u karijeri*

Variable	Gender	N	MR	U	p
<b>Attitude towards the importance of knowing ESP for study purposes.</b>	M	394	255.40	22812.50	.002**
	F	139	299.88		
<b>Attitude towards the importance of knowing ESP for professional development.</b>	M	394	256.37	23196.00	.003**
	F	139	297.12		
<b>Attitude towards the importance of knowing ESP for career advancement.</b>	M	394	257.42	23608.00	.003**
	F	139	294.16		

*N* – number of participants, *MR* – Mean Rank, *U* – Mann-Whitney U test, *p* – statistical significance (\* -  $p < .05$ , \*\* -  $p < .01$ , \*\*\* -  $p < .001$ )

Participants of this study were asked about their plans regarding their intended country of work. 45% ( $N = 236$ ) of the participants stated that they intended to pursue their careers in Croatia, 20% ( $N = 109$ ) expressed their wish to work abroad, and 35% ( $N = 185$ ) were undecided.

When analysing differences in attitudes between groups divided by intended country of work, the Kruskal Wallis H test revealed no statistically significant difference in attitudes among the three groups towards proficiency in ESP for study purposes, but a significant difference was found in the other two contexts: professional development and career advancement. Post-hoc Mann-Whitney U tests showed that respondents seeking a career abroad rated ESP as significantly more important for the purpose of professional development than respondents seeking a career in Croatia. The difference in attitudes between respondents with undefined plans for where to continue their careers and those intending to continue their careers in Croatia or abroad did not prove significant.

Post-hoc Mann-Whitney U tests showed that respondents intending to pursue their career in Croatia found ESP significantly less important for career advancement than respondents intending to pursue their career abroad and respondents with an undefined location for a career. The difference in attitudes between undecided respondents and those intending to continue their careers abroad did not prove significant (Table 8).

**Table 8.** *Kruskal Wallis H Test of the differences in attitudes towards the importance of knowing ESP in three contexts (study, professional development and career advancement) among groups divided by intended country of work (Croatia, abroad, undecided)*

**Tablica 8.** *Kruskal Wallisov H Test razlika u stavovima prema važnosti poznavanja engleskog jezika struke u tri konteksta (studiranje, stručno usavršavanje i napredovanje u karijeri) između grupa podijeljenih prema zemlji u kojoj se planiraju zaposliti (Hrvatska, inozemstvo, neodlučni)*

Variable	Intended country of work	N	MR	$\chi^2(df)$	p
Attitude about the importance of knowing ESP for study purposes.	Croatia	238	260.39	1.28(2)	.527
	Abroad	109	279.62		
	Undecided	186	268.07		
Attitude about the importance of knowing ESP for professional development.	Croatia	238	253.40	6.78(2)	.034*
	Abroad	109	295.00		
	Undecided	186	268.00		
Attitude about the importance of knowing ESP for career advancement.	Croatia	238	244.08	14.31(2)	.001**
	Abroad	109	285.88		
	Undecided	186	285.27		

*N* – number of participants, *MR* – mean rank,  $\chi^2$  – Kruskal Wallis H test, *df* – degrees of freedom, *p* – statistical significance (\* -  $p < .05$ , \*\* -  $p < .01$ , \*\*\* -  $p < .001$ )

Keeping up with the latest technological and scientific developments undoubtedly requires a good command of English. The authors wanted to find out if there would be any differences in attitudes depending on the field in which students intend to pursue their careers.

Kruskal Wallis H test revealed no statistically significant difference in attitudes towards the importance of ESP for either study purposes or professional development between groups of respondents divided by the field in which they intend to pursue a career. However, it did reveal a statistically significant difference in attitudes between these groups regarding the importance of ESP for career advancement. Post-hoc Mann-Whitney U tests showed that respondents who intend to pursue a career in science found ESP to be significantly less important for career advancement than respondents in the not-yet-defined career group. The difference in these attitudes between respondents who intend to pursue their careers in the profession and respondents who intend to pursue their careers in science and those with as yet undefined plans for the field of career proved not to be significant (Table 9).

**Table 9.** *Kruskal Wallis H Test of the differences in attitudes towards the importance of knowing ESP in three contexts (university study, professional development and career advancement) among groups divided by intended field of work (science, profession, undecided)*

**Tablica 9.** *Kruskal Wallisov H Test razlika u stavovima prema važnosti poznavanja engleskog jezika struke u tri konteksta (studiranje, stručno usavršavanje i napredovanje u karijeri) između grupa podijeljenih prema području u kojem planiraju raditi (znanost, struka, neodlučni)*

Variable	Intended field of work	N	MR	$\chi^2(df)$	p
Attitude about the importance of knowing ESP for study purposes.	Science	35	310.30	3.89(2)	.143
	Profession	369	267.16		
	Undecided	129	254.79		
Attitude about the importance of knowing ESP for professional development	Science	35	267.37	.16(2)	.922
	Profession	369	268.45		
	Undecided	129	262.74		
Attitude about the importance of knowing ESP for career advancement	Science	35	225.24	7.38(2)	.025*
	Profession	369	263.94		
	Undecided	129	287.09		

N – number of participants, MR – mean rank,  $\chi^2$  – Kruskal Wallis H test, df – degrees of freedom, p – statistical significance (\* -  $p < .05$ , \*\* -  $p < .01$ , \*\*\* -  $p < .001$ )

Correlation analyses of attitudes found a statistically significant positive correlation between year of study and the importance of ESP for the purpose of professional development (.181,  $p < .001$ ) and career advancement (.178,  $p < .001$ ) but not for study purposes. A statistically significant positive correlation was found between self-assessment of ESP at the present moment, i.e., now (ESP-n), and attitudes towards ESP in all three given contexts: for study purposes (.231,  $p < .001$ ), for professional development (.246,  $p < .001$ ), and for career advancement (.196,  $p < .001$ ). As expected, self-assessed ESP knowledge demonstrated a statistically significant, moderate positive correlation with the frequency of TLE use (.369,  $p < .001$ ). A moderate positive correlation was also found between the frequency of TLE use and attitudes in two contexts: for study purposes (.393,  $p < .001$ ), and for professional development (.386,  $p < .001$ ). A weak positive correlation was found in the context of career advancement (.290,  $p < .001$ ) (Table 10). No statistically significant correlation was found between the grade obtained on the national examination and any of the attitudes.

**Table 10.** Correlation analysis of year of study, frequency of TLE use, self-assessment of ESP – Now, and attitude about the importance of ESP in three different contexts: 1 – Study (Attitude – S), 2 – Professional Development (Attitude – PD), 3 – Career Advancement (Attitude – CA)

**Tablica 10.** Korelacijska analiza godine studija, učestalosti korištenja stručne literature na engleskom jeziku (TLE), samoprocijenjenog znanja engleskog jezika struke (EJS) u ovom trenutku i stava o važnosti EJS u tri različita konteksta: studiranje (Stav – S), 2 – stručno usavršavanje (Stav – PD), 3 – napredovanje u karijeri (Stav – CA)

Variable		Frequency of TLE use	Self-assessment of ESP-n	Attitude – S	Attitude – PD	Attitude – CA
Year of study	<i>rho</i>	.313 ***	.297 ***	.06	.181 ***	.178 ***
	<i>p</i>	< .001	< .001	.165	< .001	< .001
Frequency of TLE use	<i>rho</i>	—	.369 ***	.393 ***	.386 ***	.29 ***
	<i>p</i>	—	< .001	< .001	< .001	< .001
Self-assessment of ESP-n	<i>rho</i>	—	—	.231 ***	.246 ***	.196 ***
	<i>p</i>	—	—	< .001	< .001	< .001

Spearman's Correlations: *rho* – correlation coefficient, *p* – level of significance (\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ )

## 6. DISCUSSION

One of the objectives of the TE course is to enable students to read and understand technical texts. The expectation that the purposefulness and value of the TE course may be reflected in the frequency of the students' use of TLE for study purposes proved to be justified, although the results of this study confirmed most, but not all, of the proposed hypotheses. Namely, in the first proposed hypothesis, frequency of TLE use proved to be positively correlated with the self-assessed ESP proficiency, TE course grade, and year of study, but it seems that intended country of work (home / abroad / undecided) does not have an effect on the frequency of TLE use. A comparison of the relationship between frequency of TLE use and ESP proficiency measured using an objective (TE course grade) and a subjective (self-assessment) approach showed that self-assessed ESP proficiency was more strongly positively correlated, albeit moderately, with frequency of TLE use than the TE course grade. This result could be an indicator of the importance of self-perception for motivation and consequently behaviour.

In times of easy access to machine translation on computers or smartphones, it seems that actual knowledge of a foreign language is still an important factor in deciding to use a foreign language learning resource. Nevertheless, this activity is affected not only by the ability to use technical literature in English but also by other factors, such as actual need or necessity, motivation, or accessibility of resources. The results of this study show

that students of the Faculty of Mechanical Engineering and Naval Architecture use technical literature in English at frequencies ranging from low to moderate. This frequency of use increases with each subsequent year of study and seems to be closely related to the requirements of the curriculum. The results also show that the reported frequency of TLE use is lower than the perceived need for TLE. Thus, we can conclude that, while ESP proficiency facilitates the use of TLE, the main motivator for this is immediate need dictated by curriculum requirements. Plans for pursuing one's career abroad did not prove to be relevant for TLE use. Time might be a relevant factor here. From the students' perspective, work and career may seem too distant in time to present a "task" which should be "dealt with" at the present moment.

Interestingly, in the study conducted among students of the Faculty of Health Studies (nursing, physiotherapy, radiology technicians, and midwifery) at the University of Rijeka, the frequency of using professional literature in English was higher than in this study, while similar results were obtained in terms of correlation of frequency of TLE use and year of study (Hodak, 2022). It seems that engineering students have less mandatory reading in English in technical subjects. One of the reasons for this may be that there is more available professional literature in Croatian in the field of engineering than in the field of healthcare studies. We can also assume that the nature and dynamics of the respective fields (i.e., engineering vs. healthcare), are different in terms of the pace or volume of publication of professional and scientific papers, which dictates the possibility and feasibility of continuous and up-to-date translation. However, these assumptions would need to be explored in more detail in a separate study.

The research of attitudes in this study focused specifically on ESP. Therefore, analyses were conducted to determine whether students perceived GE and ESP as two distinct categories. The analyses revealed statistically significant results for self-assessed proficiency of GE and ESP, indicating that students do distinguish between these two categories. It was also interesting to find that they subjectively rated their knowledge of general English better than their knowledge of technical English at both points in time: before entering university and at the moment of completing the study. However, the results also suggest that they feel that, over the course of their studies, their improvement in ESP is greater than their improvement in GE. This can be attributed to the impact of the Technical English course on students' awareness of the difference between the two domains and their perception of their improved knowledge of ESP.

Hypotheses concerning attitudes towards the importance of ESP were also only partially confirmed. As hypothesised, positive attitudes towards ESP were more intense in the group of students who intended to pursue their career abroad compared to the group who plan to work in Croatia. However, they were only present in the attitudes towards the importance of ESP in the domains of professional development (weaker) and career advancement (stronger), but not for study purposes. Moreover, the positive attitude towards ESP in this particular group of students is not reflected in the frequency of their use of TLE. It seems that, even though students intending to work abroad are more aware of the importance of English for their professional development and career advancement, this is not sufficient motivation for more frequent use of TLE for study purposes. The time factor may play a role in this case: i.e., from the students' point of view career is a matter which will take place in the future, and so the importance of ESP will be a more relevant and motivating factor in the future.

Contrary to expectations, the results showed gender differences in attitudes towards ESP, with women showing stronger positive attitudes towards ESP in all three domains: study, professional development, and career advancement. Scientific reports on gender differences in attitudes regarding English as a foreign language (EFL) or ESP are not consistent. Even the two Croatian studies mentioned earlier relate opposite results. A more detailed review of the literature on this topic would be necessary to interpret the results obtained in this study and indicate the possible factors underlying gender differences in attitudes towards ESP. The question of gender differences in attitudes towards EFL or ESP is a complex issue that is beyond the scope of this paper and will therefore not be elaborated on. However, looking at of this phenomenon from an intercultural, psychological, or even neuroscientific perspective offers a variety of possibilities for future research.

As expected, there was no statistical significance between science and profession in the students' choice of field in which to pursue their career. However, the group of students who did not choose either of the two options showed a statistically significantly stronger attitude towards the importance of ESP in the context of career advancement. It seems that this group was homogeneous in some specific aspect, which is not evident in this analysis. The fourth hypothesis was also confirmed by this study: it was found that self-assessed ESP proficiency and year of study were significantly positively correlated with positive attitudes towards ESP. Also, attitudes

towards ESP were found to be positively correlated with frequency of TLE use, although the statistical significance was moderate.

## 7. CONCLUSION

The aim of this study was to gain insight into the extent to which students use learning resources in English, and to investigate whether this behaviour is related to their attitudes towards the importance of ESP in three contexts: university study, professional development and career advancement. The analyses also included observing the relationship between the two phenomena (frequency of TLE use and ESP attitudes) and the factors that the authors thought might influence them, namely, ESP proficiency (self-assessed and received course grade), year of study, gender, intended country of work, and intended field of work.

The results of this study show that students at the Faculty of Mechanical Engineering and Naval Architecture have positive attitudes towards the importance of knowing ESP in their field, the weakest being those related to study purposes and the strongest being related to career advancement. It seems that students estimate that they will need ESP more in the future, for their work and careers, than they do at the present time. Although strong positive attitudes were positively correlated with the frequency of TLE use for their studies, according to the results obtained in this study, the main motivator for using TLE seems to be mandatory reading for technical courses. The authors of this study do not have data on mandatory reading for the technical courses at the faculty, but based on the frequency of TLE use and the reported perceived need for TLE for university study, we can assume that the amount of mandatory reading in English at this faculty is low to medium, and it seems to increase with each year of study. Thus, curricular requirements seem to be the strongest factor leading to more frequent TLE use, while positive attitudes and ESP proficiency seem to be facilitating factors for more frequent TLE use. The intention to work abroad did not prove to be a strong enough motivator for more frequent TLE use. It seems that, while students recognise the importance of ESP for professional development as well as career advancement regardless of the country of work, they perceive these circumstances as distant in time and not requiring immediate action or preparation.

It was intriguing to find that students at the Faculty of Mechanical Engineering and Naval Architecture use technical literature in English less frequently than students at the Faculty of Health Studies at the University of

Rijeka. This may be due to the highly dynamic nature of the field of biomedicine and healthcare both in basic medical sciences and clinical practice, which makes it difficult for the educators to provide timely translations of the needed sources. It would be interesting to conduct a comparative study at several universities and with students from different disciplines and investigate the reasons for such discrepancies from the perspective of the curricula, the specific characteristics of the professional field, and the Croatian translation industry. The need for ESP proficiency could also be examined in different professional contexts and across disciplines in the context of its actual importance for professional development and career advancement.

The goal of the Technical English course at the Faculty of Mechanical Engineering and Naval Architecture is to provide students with a foundation upon which they can build to eventually become independent and competent users of technical literature in English. However, proficiency can only be achieved through the continuous and frequent use of TLE in authentic situations that serve a specific technical problem or need. Students should be encouraged to use LSP sources outside the LSP course framework, to ensure that they become confident users of LSP in their professional environment and to continue learning on their own.

The authors are aware that there are limitations to this study which consist primarily in the lack of research on the use of professional literature in English by students in non-English-speaking countries. Therefore, the instrument used in this study was created by the authors and is based on a similar questionnaire used in the aforementioned study at the Faculty of Health Sciences University of Rijeka (Hodak, 2022). On the other hand, attitudes and motivation have been widely researched and verified, and elaborate testing instruments are available. However, the authors decided to use custom-made questions on attitudes about ESP as they felt that a simplified and more topic-oriented questionnaire would be more suitable for the purpose of this study.

The results of this study cannot be generalised for other technical faculties in Croatia. Further similar studies should be conducted in order to arrive at more general information on the frequency of use of professional literature in English by students in Croatia.

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## Korištenje stručne literature na engleskom jeziku i stavovi studenata strojarstva i brodogradnje prema engleskom jeziku struke

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S obzirom na brzi razvoj znanosti i tehnologije te činjenicu da se velika većina znanstvenih i stručnih radova objavljuje na engleskom jeziku, poznavanje engleskoga jezika nužno je za praćenje najrecentnijih dostignuća u nekom području. Cilj ovoga istraživanja bio je dobiti uvid u to koliko često studenti Fakulteta strojarstva i brodogradnje Sveučilišta u Zagrebu koriste stručnu literaturu na engleskom jeziku za potrebe studiranja i je li isto povezano sa stavovima studenata o važnosti poznavanja engleskoga jezika struke u tri konteksta: za studiranje, profesionalni razvoj i napredovanje u karijeri. Istraživanje je provedeno putem *online* upitnika koji su izradili autori. U istraživanju je sudjelovalo 533 studenata strojarstva i brodogradnje (394 muškaraca i 139 žena) sa svih godina studija. Rezultati su pokazali da se studenti koriste stručnom literaturom na engleskom jeziku rijetko do umjereno. Čini se da su kurikulni zahtjevi najznačajniji čimbenik za korištenje stručne literature na engleskom jeziku, dok su pozitivni stavovi prema važnosti poznavanja engleskoga jezika struke i poznavanje engleskoga jezika struke čimbenici koji olakšavaju učestalije korištenje stručne literature na engleskom jeziku.

Ključne riječi: *engleski jezik struke, stručna literatura na engleskom jeziku, stavovi studenata*