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## **Vocabulary Acquisition through Thesaurus Modelling within ESP Course for Engineering Students**

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### **Abstract**

The paper is intended to reveal positive experience of applying a newly-elaborated thesaurus modelling technology which represents an effective tool of engineering pedagogy process involving comprehensive learning of the professional vocabulary. The participants of the research were second-year engineering students of the mineral resources specializations in St. Petersburg Mining University. Conventional-based way of learning English professional terminology and vocabulary acquisition through thesaurus modelling within ESP course were used in control and experimental groups accordingly during the academic year of 2022–2023 which entails writing assignments accomplishment and final essay assessment. The gathered data were manually put into the SPSS software and analyzed statistically with the chi-square test output with identification of p-value.

The purpose of the study was to determine what impact thesaurus modelling technology has on the mastering of such general competences as communication, project development and implementation, teamwork and leadership, critical thinking, self-regulation while teaching professional vocabulary to engineering students within ESP course. The results of the final essay assessment as well as the results of the general competences questionnaire proved to be statistically effective and revealed uneven distribution. The interpretation of the results showed that although communication skills and self-regulation capacity have been mastered almost equally by students of both groups, other general competences as project development and implementation, teamwork and leadership have been developed by the experimental group much more profoundly than the control group.

**Keywords:** engineering education, professional vocabulary acquisition, thesaurus modelling, ESP, general competences, communication skills, critical thinking, team-work, terminology mastery.

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## 1. Introduction

Due to the obvious fact pointed by numerous researchers that “mineral resource complex” (Khrustaleva et al., 2021: 417) along with “mineral resources as natural capital” (Litvinenko et al., 2023: 95) and “a pronounced resource specialization” (Bykova et al., 2023) representing a clear-cut factor of a country’s sustainable development, the segment of the mining engineering education should be given particular emphasis as a key factor of technological and scientific progress (Bergamo et al., 2022; Gutierrez-Bucheli et al., 2022; Sigahi, Szelwar, 2023). Technical education “needs modern and sophisticated methods” (Skornyakova, Vinogradova, 2022: 100) to keep in line with the demands of the global labour market demand. Gerasimova et al. assert that highly-qualified specialists “being essential for the sustainable economic development” are in great demand nowadays (Gerasimova et al., 2021).

Among substantial purposes of engineering specialties educational process is the integration of interdisciplinary bonds since integrative educational courses improve students’ ability “to think systematically and independently, to use a set of knowledge and skills that allow effectively solving professional problems” (Goldobina et al., 2020: 803). Future engineering specialists undergo a holistic competence-based education approach to be entirely prepared for their upcoming career path (Chan, Luk, 2022; Franco et al., 2023; de Oliveira et al., 2023). Key engineering competences are highlighted and scrutinized through the lens of professional engineering ethics (Ovchinnikova, Krotova, 2022).

Mining specialists training needs implementing modern educational technologies and methods, among which there is also an important concept of “global focus of training, i.e. graduates are prepared to work worldwide” (Kretschmann et al., 2020: 248), which emphasizes foreign language communication ability. Both researchers and professional communities agree that “high-skilled engineering workforce with proficient knowledge of foreign languages is in demand in a globalised world with knowledge-based economies” (Pushmina, Karter, 2021: 150).

Following the labour market need for comprehensively-skilled and all-round specialists, Saint Petersburg Mining University teachers apply novel educational methods, for example, blended learning model of traditional and digital components of ESP course (Gerasimova et al., 2022), the corpus approach in ESP teaching (Boyko, Koltsova, 2023), integrative Business English course for master’s students (Varlakova et al., 2022).

In its educational programmes, Mining University first and foremost is guided by the Federal State Education Standard of the Russian Federation which stipulates acquisition of a number of competences. Within this work, some general and professional competences are considered that can be obtained during the course of foreign language. Among these competences are: communication, critical thinking, leadership/teamwork, project development and implementation, self-regulation.

Mastering a foreign language for future professional communication as well as development of further general competences are in the limelight of the educational institutions all over the world (Awang, Daud, 2015; Burkholder, 2021; Castelló, 2023), and Saint-Petersburg Mining University is of no exception. This is why future engineers studying in this university are taught various aspects of professional communication in the foreign language, including different types of professional vocabulary acquisition. This research focuses attention on the thesaurus modelling method.

In the recent decade there has been widespread attention paid by multiple researchers on various thesauruses modelling in different domains and for different purposes. V. Radygin et al. have created a thesaurus for thematic search for violations of the public procurement Federal Law of the Russian Federation (Radygin et al., 2021). L. Scutelnicu demonstrates CoRoLa Corpus for contemporary Romanian language summing up almost 1 billion Romanian words from a wide range of domains, covering all literary genres. The CoRoLa corpus has been developed for four years, since 2017 it is visible for research (Scutelnicu, 2021). F. Meng et al. propose a method of domain keyword extraction and construct a thesaurus for domain news (Meng et al., 2022). I. Subirats-Coll et al. give a comprehensive description of AGROVOC, a multilingual and controlled vocabulary designed to cover concepts and terminology under Food and Agriculture Organization of the United Nations’ areas of interest. This thesaurus uses both hierarchical and non-hierarchical relations among concepts. It has been Linked Open Data since 2018 (Subirats-Coll et al., 2022). The principles of compiling a bilingual dictionary of investment terms have been scrutinized in the paper by (Shageeva et al., 2022). Important aspects and practical values of Modern Chinese thesaurus for Mandarin native speakers in terms of nursing field are thoroughly described in the

study of Indonesian scientists (Wiratikusuma, Wiratikusuma, 2022). All these researches emphasize the fact that domain thesauruses facilitate the search of the requested relevant information.

Summarizing the points of view illustrated above, we hold the view that thesaurus is a set (arrangement) of words (or terms) organized in a hierarchical system according to their interrelations. There are different types of thesaurus, while one of the most popular and widely-used types of thesaurus is a set of synonyms (Roget's Thesaurus – <https://icourse.club/uploads/files/bao2bc65d60c1fef8e082fc48b344d75fbf81b40.pdf>).

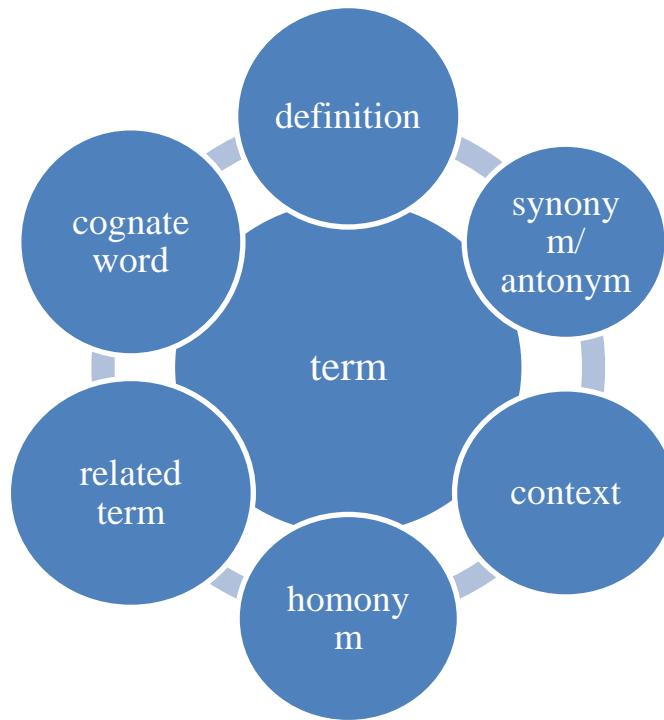
There are much more comprehensive thesauruses which include a lot of linguistic information and give relations and ties between the words in the form of a graph: <https://www.freethesaurus.com/>.

The authors of the present paper are in full agreement with a number of researchers who consider thesaurus modelling as an effective tool in teaching terminology in a technical university. According to R. Deniko et al., terminological training has a significant effect on communicative and cognitive competences development. Having a good command of terminology empowers students with abilities to better carry out information analysis, notion conceptualization, to solve engineering tasks much more profoundly. Thus, the exact terminology equivalents knowledge helps future engineering specialists make professional communication more effective. Because of the growing polysemy and synonymy, there is “a need for standardization work that can be done in the form of information thesaurus” (Deniko et al., 2015). M. Martin and co-authors have created and implemented the thesaurus of manufacturing engineering terms through the Virtual Campus where students were supposed to design their own thesauruses according to the given pattern: term, its etymology, English translation, definition sources, reference in a real text, critical review, traceability, related terms, illustrative image (Martin et al., 2015: 216-216). As M. Martin and his colleague assert, thesaurus modelling has become an effective teaching tool being in a continual state of growth and improvement. We definitely support this point of view. G. Chainikova et al. describe a pedagogical method of “lexical competence development on the basis of a Learner's terminological thesaurus and dictionary of software term” (Chainikova et al., 2018: 51). The thesaurus and dictionary in this technology are represented through four parts – classification, ideographic part, glossary, bilingual dictionary – and proves to be effective. The postulate of thesaurus being an influential didactic tool is shared by the researchers M. Bazhutina and O. Brega, who declare thesaurus modelling principles beneficial in teaching scholarly abstract writing to graduate students (Bazhutina, Brega, 2019). A. Bagiyan et al. propose pragmatic and axiological linguistic modelling as an indispensable tool in shaping a professional identity of a student. They meticulously describe methods used and highlight positive results of the suggested modelling (Bagiyan et al., 2021).

From the above mentioned studies, we can definitely conclude that thesaurus modelling technology implementation is growing rapidly. All these findings are in line with the present research focused on interrelation between general competences development and thesaurus modelling. The distinctive feature of the current paper is that it deals with the interrelation between not only the communicative competence and professional vocabulary acquisition through non-conventional education process as stated in the above mentioned researches, but also such competences as project development and implementation, teamwork and leadership, critical thinking, self-regulation. The authors have scrutinized the indicators of the given competences achievement marked by the students themselves while giving responses in the questionnaire.

There is no denying the fact that vocabulary acquisition is one of the biggest issues for engineering students who are studying foreign language (Otto, 2021; Rus, 2020; Kamrotov et al., 2022). There are various teaching methods suggested by researchers, such as implementation of a mobile learning application (Poláková, 2022) or the influence of the spacing effect on targeted vocabulary learning (Yan, Zhou, 2023). In Saint Petersburg Mining University, engineering students have to learn a list of basic vocabulary of their specialization. We suggest using thesaurus as a tool for vocabulary acquisition.

Having scrutinized all the possible types of thesaurus, we elaborated a thesaurus modelling scheme for the purposes of our ESP course (see Figure 1).



**Fig. 1.** Thesaurus modelling scheme  
Compiled by E. Vinogradova

Having processed various types of thesauruses, the authors of this research have elaborated those aspects of thesaurus modeling technology that are particularly important for the engineering students. These aspects are: filling in the table of the thesaurus modelling assignment; discussion and guessing of the given terms in pairs, in threes, in groups; final essay writing and its assessment.

The focus of the present study is to prove that there is positive correlation between the thesaurus modelling in the ESP course and effective development of general competences. Hence, a novel approach has been elaborated where the use of thesaurus modelling is introduced and implemented. Among the aims of the research is to track the ESP students' general competences acquisition in terms of professional vocabulary acquisition in two different formats – conventional-based education process vs. thesaurus modelling technology application. In the view of this, the research questions put forward by the authors are the following:

- Does the general competences mastering through thesaurus modelling technology while learning professional vocabulary within ESP course prove to be effective?
- Does the thesaurus modelling technology while learning professional vocabulary within ESP course prove to be effective in terms of academic performance in final essay assignment?

In order to answer the research questions, the null and alternative hypotheses were formulated and then verified through the research.

(1) Null hypothesis – There is no significant difference between vocabulary acquisition through the thesaurus modelling technology and vocabulary acquisition through conventional method in terms of engineering students' general competences development.

Alternative hypothesis – There is a significant difference between vocabulary acquisition through the thesaurus modelling technology and vocabulary acquisition through conventional method in terms of engineering students' general competences development.

(2) Null hypothesis – There is no significant difference between students' academic performance when implementing the thesaurus modelling task and students' academic performance when implementing conventional assignments.

Alternative hypothesis – There is a significant difference between students' academic performance when implementing the thesaurus modelling task and students' academic performance when implementing conventional assignments.

## 2. Materials and methods

During the 2022/2023 academic year the authors of this research introduced with their students at Saint Petersburg Mining University an experimental system of using thesaurus

modelling technology during the course of foreign language. In this paper, it is considered that apart from the communicative competence, the students are supposed to gain further skills: critical thinking, teamwork, project implementation, self-regulation capacity.

The participants are full-time 2-nd year students (irrespectively of gender) from seven faculties of various engineering specializations connected with the mineral sector: faculty of oil and gas engineering, faculty of geological exploration, mining faculty, civil engineering faculty, faculty of mineral processing, energy faculty, faculty of economics. Total number of the participants is 188 students (see Table 1). 89 of them were in the experimental group who were offered to learn professional vocabulary through thesaurus modelling technology. The control group included 99 people who had conventional tasks of learning terminology by heart, writing dictations, oral answering of memorized terms. It should be noted here both experimental and control groups included approximately the same number of students. The main requirement for the groups distribution was the equal proportion of the students with the same English proficiency level.

**Table 1.** Participants distribution

	N	Percentage
Experimental group	89	47,3
Control group	99	52,7
Total		

Since the aim of the experiment was the format of the professional vocabulary acquisition (traditional learning by heart vs. thesaurus modelling technology) in general, there was made no distinction between various faculties. The only difference was in terms of vocabulary lists taught to students of corresponding specialties.

On the basis of the thesaurus scheme we developed an assignment aimed at thorough work with terminology list. It helps students not only study new words, but also build up a cognitive map of their professional field through understanding important notions (terms) and relation to other terms.

**Table 2.** Thesaurus modelling assignment

definition	cognate word	context
	term	
synonym/antonym		homonym
	related term	

Upon completion of the experiment, the participants filled in a questionnaire revealing the results of competences acquisition in both groups. Also, the experimental group was offered to express their attitude towards the novel approach to studying the professional vocabulary as well as to define how hard it was for them to fill in each box. The questionnaire included the following aspects: task analyzing skill, critical thinking skill; the ability to determine the scope of tasks within the set goal and the choice of optimal ways to solve them (project development and implementation), the ability to define one's role in social interaction and teamwork, based on a cooperative strategy to achieve a given goal (teamwork), the ability to use tools and methods of time management when performing specific tasks (self-regulation capacity). Tables 3-7 represent the corresponding questions and the answers of both groups. A 5-point Likert-scale ('1' for 'definitely disagree', '2' for 'rather disagree', '3' for 'undecided', '4' for 'rather agree', '5' for 'definitely agree') was used to measure the responds.

After having implemented the thesaurus modelling assignment students from both groups were supposed to write the final essay focused on their future speciality and sphere of the studies. The topics suggested for the students were as follows: What is your planned speciality? What are advantages and disadvantages of your future profession?; What are prospective technologies of the education field that you study? Are there any threats or possible dangers of the scientific breakthroughs?; What impact does your education field have on the environment? What are possible ways to mitigate this impact?

Each student was given an answer sheet A4 format. An essay topic and assessment criteria were pointed in the upper part of an answer sheet. The same writing final essay conditions were

provided for students of both groups. A time-limit of 40 minutes was set for writing the final essay. What is more, it should be noticed that the students were not allowed to use any additional materials while accomplishing the given assignments. The assessment scale was developed by the authors in accordance with educational programmes of Saint-Petersburg Mining University in the course of “Foreign language”. Since the focus of the experiment is on the professional vocabulary acquisition through thesaurus modelling technology, the researchers scrutinized lexical aspect of the writing assignment and elaborated an extended scale of five lexical aspects: 1) Proper usage of professional vocabulary (adequate choice of the terms with proper meaning, problem of polysemy/multiple meanings); 2) terminology spelling; 3) sophisticated language (vocabulary level complies with their CEFR level – B1, B2, C1); 4) synonyms (diversity, no tautology); 5) word formation (usage of suffixes, usage of prefixes, word building). For each aspect, a student could get 2 points if the student’s lexical aspect is presented in a perfect manner. 1 point is given in case the student has minor mistakes in the aspect. A student gets 0 points if he or she made more than three mistakes in the lexical aspect. With a total of 10 points, a student gets a “5” mark for the lexical aspect, 6-8 points are granted with a “4” mark, 3-5 points mean a “3” mark, 0-2 points means that the student failed and gets a “2” mark. The results of the lexical aspect of the essay show the effectiveness of the described methodology and are given further in Paragraph 3, Table 8.

### 3. Results

#### 3.1. Statistical analysis

The gathered data regarding the students’ performance in the final assignment as well as their responses to the questionnaire were manually organized into Excel file and further processed through the Statistical Package for the Social Sciences (SPSS) 17 software (IBM) for Windows (64-bit version) in order to answer the research questions, check the hypothesis and verify statistical significance of the research. Statistical analysis included the chi-square criterion calculation for contingency tables and hypothesis significance testing through p-value. The observed frequencies of the variable Critical thinking statistically significantly differ in the experimental and control groups with the p-value being  $P < 0.001$ . At the same time, the frequency of respondents’ positive answers prevails in the experimental group. For example, the proportion of respondents from the experimental group who agree with the statement is 63.1 % higher than of those from the control group (see Table 3).

**Table 3.** “Critical thinking” competence achievement

Variables	Responses	Parameters	Group		Variation, %	Chi-square criterion	P-value
			Experimental	Control			
Critical thinking	Definitely disagree	Frequency	0	16	-	79,5	<0,001
		%	0,0 %	16,2 %	-100,0 %		
	Rather disagree	Frequency	3	25	-		
		%	3,4 %	25,3 %	-86,7 %		
	Undecided	Frequency	7	27	-		
		%	7,9 %	27,3 %	-71,2 %		
	Rather agree	Frequency	44	30	-		
		%	49,4 %	30,3 %	63,1 %		
	Definitely agree	Frequency	35	1	-		
		%	39,3 %	1,0 %	3793,3 %		

The observed frequencies of the variable Project development and implementation statistically significantly differ in the experimental and control groups with the p-value being  $P < 0.001$ . The frequency of respondents’ positive answers prevails in the experimental group. For example, the proportion of respondents from the experimental group who agree with the statement is 207.5 % higher than in the control group (see Table 4).

**Table 4.** “Project development and implementation” competence achievement

Variables	Responses	Parameters	Group		Variation, %	Chi-square criterion	P-value
			Experimental	Control			
Project development and implementation	Definitely disagree	Frequency	1	25	-	101,2	<0,001
		%	1,1 %	25,3 %	-95,6 %		
	Rather disagree	Frequency	2	40	-		
		%	2,2 %	40,3 %	-94,4 %		
	Undecided	Frequency	10	17	-		
		%	11,2 %	17,2 %	-34,6 %		
	Rather agree	Frequency	47	17	-		
		%	52,8 %	17,2 %	207,5 %		
	Definitely agree	Frequency	29	0	-		
		%	32,7 %	,0 %	-		

The observed frequencies of the variable Teamwork and Leadership are statistically significantly different in the experimental and control groups with the p-value being  $P < 0.001$ . The frequency of respondents’ positive answers prevails in the experimental group. For example, the proportion of respondents from the experimental group who agree with the statement is 122.5 % higher than in the control group (see [Table 5](#)).

**Table 5.** “Teamwork and Leadership” competence achievement

Variables	Responses	Parameters	Group		Variation, %	Chi-square criterion	P-value
			Experimental	Control			
Teamwork and Leadership	Definitely disagree	Frequency	0	25	-	79,6	<0,001
		%	,0 %	25,3 %	-100,0 %		
	Rather disagree	Frequency	4	36	-		
		%	4,5 %	36,4 %	-87,6 %		
	Undecided	Frequency	23	18	-		
		%	25,8 %	18,2 %	42,1 %		
	Rather agree	Frequency	40	20	-		
		%	44,9 %	20,1 %	122,5 %		
	Definitely agree	Frequency	22	0	-		
		%	24,8 %	,0 %	-		

The observed frequencies of the variable Communication are statistically significantly different in the experimental and control groups with the p-value being  $P < 0.001$ . At the same time, the frequency of full agreement of respondents prevails in the experimental group. For example, the share of respondents from the experimental group who totally agree with the statement is 219.8 % higher than in the control group (see [Table 6](#)).

**Table 6.** “Communication” competence achievement

Variables	Responses	Parameters	Group		Variation, %	Chi-square criterion	P-value
			Experimental	Control			
Communication	Definitely disagree	Frequency	0	1	-	54,4	<0,001
		%	,0 %	1,0 %	-100,0 %		
	Rather disagree	Frequency	3	5	-		
		%	3,4 %	5,1 %	-33,3 %		
	Undecided	Frequency	2	9	-		
		%	2,2 %	9,1 %	-75,3 %		
	Rather agree	Frequency	15	60	-		
		%	16,9 %	60,6 %	-72,2 %		
	Definitely agree	Frequency	69	24	-		
		%	77,5 %	24,2 %	219,8 %		

The observed frequencies of the variable Self-regulation statistically significantly differ in the experimental and control groups with the p-value being  $P = 0.020$ . At that, the frequency of full agreement of respondents prevails in the experimental group. For example, the share of respondents from the experimental group who fully agree with the statement is 70.1 % higher than in the control group (see [Table 7](#)).

**Table 7.** “Self-regulation” competence achievement

Variables	Responses	Parameters	Group		Variation, %	Chi-square criterion	P-value
			Experimental	Control			
Self-regulation	Definitely disagree	Frequency	0	1	-	11,6	0,020
		%	,0 %	1,0 %	-100,0 %		
	Rather disagree	Frequency	4	7	-		
		%	4,5 %	7,1 %	-36,4 %		
	Undecided	Frequency	5	7	-		
		%	5,6 %	7,1 %	-20,5 %		
	Rather agree	Frequency	28	50	-		
		%	31,5 %	50,5 %	-37,7 %		
	Definitely agree	Frequency	52	34	-		
		%	58,4 %	34,3 %	70,1 %		

Summarizing the statistical analysis data represented in [Tables 3-7](#), we are sure to reject the first null hypothesis which states that there is no significant difference between vocabulary acquisition through the thesaurus modelling technology and vocabulary acquisition through conventional method in terms of engineering students' general competences development. The statistical results showed that the general competences of communication, teamwork, project development and implementation were developed much more profoundly by the experimental group.

The observed frequencies of the variable Mark are statistically significantly different in the experimental and control groups with the p-value being  $P < 0.001$ . At that, the frequency of excellent grades (mark “5”) in the experimental group is 252.2 % higher than in the control group.



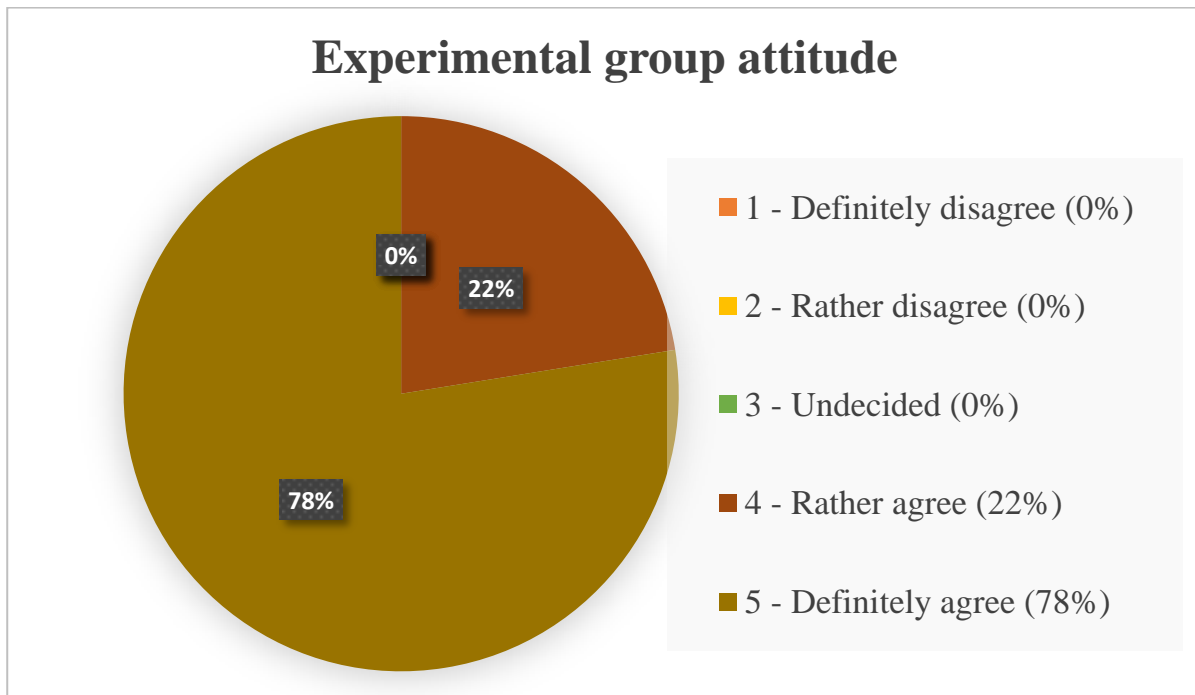
**Table 8.** Students' academic performance in terms of lexical aspect

Variables	Mark	Parameters	Group		Variation, %	Chi-square criterion	P-value
			Experimental	Control			
Mark	2	Frequency	0	1	-	43,2	<0,001
		%	,0 %	1,0 %	-100,0 %		
	3	Frequency	10	37	-		
		%	11,2 %	37,4 %	-69,9 %		
	4	Frequency	22	43	-		
		%	24,8 %	43,4 %	-43,1 %		
5	Frequency	57	18	-			
	%	64,0 %	18,2 %	252,2 %			

The second null hypothesis can also be rejected as there is a significant difference between the marks of the final essay lexical aspect in the groups examined during the pedagogical experiment.

**3.2. Experimental group attitude**

In order to back up the gained results, the attitude of the experimental group should also be given. The students expressed their attitude through a separate questionnaire upon the completion of the ESP course using the thesaurus modelling method. Students were asked to give responses on a 5-point Likert scale to the statement "I consider that the process of professional vocabulary acquisition within the method of thesaurus modelling is effective and advantageous" (See Figure 2).

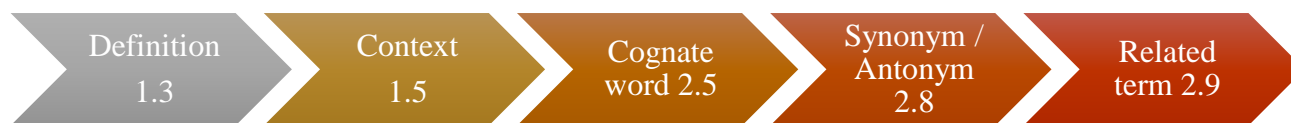


**Fig. 2.** Experimental group attitude  
Compiled by E. Vinogradova

As it can be seen in Figure 2 above, the overall majority of the participants consider the thesaurus method an effective and advantageous one, since there have been no negative or indecisive responses to the posed statement and 22 % rather agree and 78 % definitely agree with the statement.

Furthermore, it is essential to reflect the participants' point of view on the assignment difficulty. The students were asked to rate the parts of the assignment (outlined in Paragraph 2 and

Table 2) from the point of view of their difficulty and challenge on a scale of 1 to 5 where 1 is the easiest and 5 is the most difficult (See Figure 3)



**Fig. 3.** Assignment parts difficulty level  
Compiled by E. Vinogradova

Figure 3 illustrates the assignment difficulty level distribution according to the experimental group opinion poll. The respondents rated the task of giving definition while compiling the thesaurus as the easiest one – mean level is 1.3 points (out of 5); while the most challenging part of the assignment was to figure out the related terms – mean level is 2.9 (out of 5).

#### 4. Discussion

The results described above have various grounds and may be considered in different ways in order to continue the experiment in the right direction. So let us consider the students' achievement level of every general competence under study separately.

Regarding critical thinking skill the following fact should be mentioned. Among the academic community there has arisen an "awareness about the symbiotic relationship between language teaching and critical thinking development" (Yuan et al., 2022). Numerous researchers highlighted the utmost importance of students' critical thinking skills development (Fan, See, 2016; Moeiniasl et al., 2022; Pisani, Haw, 2023). The present survey displays that most students who underwent the thesaurus modelling technology within ESP course much better managed to quicker analyze the given task and find out the requested relevant information from reliable sources in a short period of time.

Concerning the question about the project development and implementation during the education process it has to be said that, since it's widely acknowledged that "foreign-language project-based method as means of forming professional competence has a great educational potential" (Beltykova et al., 2015). It should be noticed that project-based learning is widely used in engineering education (Ruslan et al., 2021; Rio, Rodriguez, 2022). The students who were taught with a novel approach to professional vocabulary acquisition through thesaurus modelling could much more easily understand and detect the scope of work within the set goal and choose optimal ways to implement it.

The third question of the students' questionnaire revealed the attitude to Teamwork and Leadership competence achievement. The experiment participation demonstrated the high-potential ability of experimental group to define their role in social interaction and teamwork while discussing the engineering terms thesauruses, based on a cooperative strategy to achieve a given goal. "Developing teamwork skills is particularly important" as it broadens the diversity of competence gained through education (Wilson, Rowan, 2017). Teamwork competence survey has been delved into in multiple researches (Awuor et al., 2022; Baviera et al., 2022; Gerbeth et al., 2022).

The fourth – communicative skill toward which "the emphasis of language teaching is now directed" to the greatest extent (Huang, 2021) – proved to be almost equally developed either during the experiment or within the conventional education process. This fact demonstrates that communication is the inseparable part of any foreign language lesson no matter what novel technologies are being implemented. Thus, each engineering student is to acquire a good command of communicative skills.

The fifth question revealed the self-regulation capacity achievement. Self-regulation entails "cognitive, metacognitive, motivational, behavioral, and environmental processes that learners can apply to enhance academic achievement" (Rose et al., 2018). The results showed practically the same level of this general competence mastery. Time-management skills when performing specific tasks are almost equally developed by 2-nd year engineering students as such skills are formed during the whole education process in a technical university not depending on the discipline.

Students' attitude to the thesaurus modelling assignment is absolutely approving, while their perception of the assignment difficulty varies, which is important since there is interrelation between "students' interest, self-efficacy, and perceived difficulty" as they play "a distinctive role in

the dynamics of task-specific motivation” and competence (Nuutila et al., 2021). These issues determine direction for the further research.

Taking into account the abovementioned, thesaurus modelling technology implementation while learning professional vocabulary proved to be effective and beneficial in terms of holistic competence-based education process improvement.

## 5. Conclusion

1. The results of the final assignment verifying the results of the experiment turned out to be different in control group with the conventional education format and in the experimental group with the thesaurus modelling technology. Academic performance of the students who underwent terminology memorizing in thesaurus modelling technology format proved to be higher.

2. It was established that the competences of critical thinking, teamwork, project development had developed unevenly in cases of the traditional way of acquiring terminology and thesaurus modelling. The control group of students who underwent conventional education process did not obtain sustainable skills of the aforesaid competences, however, communicative skills and self-regulation capacity in terms of time-management were developed almost equally since they are supposed to be formed within the whole education process in a technical university.

Summing up, it should be pointed out that vocabulary studying in the conventional educational format proved to be equally effective in terms of obtaining communication competence and self-regulation competence of future engineers, which cannot be stated about the development of other general competences as critical thinking, teamwork, project development and implementation. Thesaurus modelling technology declared to be a beneficial didactic tool in shaping professional language personality encompassing the ability of becoming a highly-qualified specialist essential for a country's sustainable development.

## 6. Limitations

The research is limited to the engineering specialization of mineral sector. It was conducted in an engineering university of mineral sector and is restricted to the students of a number of specializations. Some allowance might be entailed due to the research method of opinion poll since it might be partly subjective. It should also be mentioned that mastering of general competences such as communication, critical thinking, teamwork, project development and implementation and self-regulation has been considered precisely within the framework of professional vocabulary learning tasks.

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