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Development of Engineering Students' Motivation and Independent Learning Skills

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Abstract

The current study examines ways of engineering students' development of motivation and independent learning skills which are considered to be the most influential factors for effective language learning in the groups of young adults. As the discipline "Foreign language" is not a major subject in most technical universities in Russia, the number of academic hours allocated for it is limited, moreover, engineering students show low motivation to practice a second language outside the classroom. Besides, as teaching practice shows the first-year students' independent learning skills are not yet developed enough. Therefore, the authors aimed to find ways to enhance their students' motivation to master English and teach them how to manage their extracurricular time more effectively. A two-stage survey was conducted in the 2020-2021 academic year in experimental and control groups of the first-year students at Saint Petersburg Mining University for which special questionnaires were designed. The analysis of the participants' responses allowed selecting the most efficient language learning tools and their effectiveness was assessed at the end of the academic year. The authors also determined the relation between the selected various teaching tools and non-technical competences mastering. The authors managed to define how the selected teaching tools can be beneficial for developing each of these core competences, viz. critical thinking, project work, team-building, leadership, communication, cross-cultural interaction and self-development.

Keywords: competences, motivation, independent learning skills, engineering students, learning English.

1. Introduction

According to the Federal State Education Standard of the Russian Federation future engineering specialists are to acquire general competences which can be mastered in the course of

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second language learning: critical thinking, project work, team-building, leadership, communication, cross-cultural interaction and self-development. As the Mining University trains future engineering specialists the authors need "to analyze professional goals in programs" (Goman, 2019: 012013), to develop students' competencies "in order to adapt or relate expertise needed for future job with the graduates' competence assessment" (Sishchuk et al., 2020: 810) and indicate that the quality of students' professional education is connected to such aspects as "academic staff; content of courses; educational environment" (Goldobina, Orlov, 2017: 264). The international authoring teams point out "the need for international integration in the issues of training and continuous professional development of mining specialists" (Kazanin, Drebenstedt, 2017: 369) like "involving foreign professors in the educational process by means of electronic learning tools" (Katuntsov et al., 2017: 503) and stress that "the global focus of training and provision of academic mobility for students" (Kretschmann et al., 2020: 248) are of great importance nowadays. Apart from attaining professional competences it is widely recognized that the "21st century is a new era of social diversity and information technology, therefore in order to keep up with the times, constant learning is required from everyone" (Lin et al., 2016: 387).

Therefore, mastering English is a key to successful academic mobility and professional development but the discipline "Foreign language" is not considered a major subject in technical universities. It leads to a limited number of academic hours allocated for it and engineering students seem to have lack of motivation for learning English as a second language. They need to learn how to manage their extracurricular time more effectively. In this research an attempt was made to analyze the correlation between engineering students' motivation and improvement of their independent learning skills and specify its importance for mastering general competences by students.

2. Literature Review

It is widely acknowledged that motivation plays a pivotal role in achieving success in many students' learning activities. Generally, motivation is defined as "a set of intrinsic and extrinsic motive forces" [Tarasova et al., 2015: 190] that enhance people to carry out activities, find forms of their implementation, and focus on achievement of certain goals. The integrative – instrumental dichotomy of motivation [Gardner, 2006] combines interest and willingness to find out about culture and traditions, to communicate with native speakers and practical purposes of learning a second language.

Several research frameworks offer various descriptions of extrinsic and intrinsic motivation. For instance, extrinsic motivation (Topîrceanu, 2017) includes external regulation, introjection (assimilation of external motivators), identification (alignment with personal needs), integration (complete internal alignment); intrinsic motivation means reward in itself, fun and pleasure. Self-determination theory defines intrinsic motivation as "spontaneous feelings of enjoyment" while extrinsic motivation is represented by "an external reward or social approval, avoidance of punishment, or the attainment of a valued outcome" (Ryan, Deci, 2017: 14).

Most researchers agree that there are "several influential factors" that affect students' competence development (Asfani et al., 2016: 416). Some of them have recently identified a number of issues closely related to motivation aspects in entrepreneurship education (Haneberg, Aaboen, 2020), positive self-esteem through positive psychology (Chen et al., 2021), "trajectory of intrinsic reading motivation" (Miyamoto et al., 2020: 101921), blended learning for health sciences students (Alabdulkarim, 2021), readiness for online learning (Rafique et al., 2021; Tang et al., 2021), perception, motivation and attitude analysis approach among undergraduate students (Saini et al., 2020), the mediating role of achievement motivation (Moghadam et al., 2020), correlation between academic achievement and professional identity (Wasityastuti et al., 2018).

Scholars underline that motivation is a complex, multi-faceted system of stimuli, including needs, interests, aspirations, emotions, values, etc. Intrinsic motivation facilitates cognitive, physical and social development of a student. It has resulted in a lower dropout rate, higher-quality learning, and better learning strategies. Extrinsic motivation is connected with receiving higher academic grades, awards and prizes. Motivated students take part in learning activities with much more interest, effort and perseverance. Therefore, different learning tools can be used to engage students into a greater variety of communication activities. Information and communication technologies play a significant role in competences mastering. For instance, computer assisted

translation and Lingvo Tutor "improve the skills of text processing and analyzing" (Vinogradova et al., 2020: 407).

To enhance students' motivation they can accomplish online course "focused on information technologies in learning" and developed "for accessing to learning materials, such as texts, audio, video materials" (Murzo et al., 2019: 143), use "the integration of social media" on the example of Instagram "as a teaching tool" and English for Specific Purposes/English "as medium of instruction" training (Pushmina, 2020: 475, 481), adhere to a model "aimed at cultivating technically relevant environment … and fostering translation skills" (Pushmina, Karter, 2021: 150). Development of engineering students' motivation can also be enhanced within the framework of the concept of "edutainment", strategy of learning technologies aimed at raising interest due to analogy with popular forms of recreational leisure time (Rassadina, 2016).

Motivation is also a key factor facilitating development of independent learning skills among students. At the tertiary level students cannot always count on the support of their teacher, therefore, they will need to learn on their own a lot. Being a rather continuous process, independent learning skills acquisition requires changing the traditional roles of both teachers and students (Hassan, 2018).

The Federal State Educational Standard of the Russian Federation allocates a certain number of hours (as a rule, about a half of the total labor intensity of the discipline) for independent work of students. Thus, training at university consists of two complementary, interrelated, and equally important components – the actual educational process carried out in the classroom or remotely under the teacher's continuous supervision (synchronous and asynchronous distance learning as it was organized during coronavirus lockdown) and independent work of students. Only high-quality systematic and conscious involvement in both components results in forming a competent specialist of the appropriate level, competitive in the labor market, responsible, and ready for constant professional growth, social and professional mobility.

Among the benefits of possessing independent learning skills, we should mention the fact that autonomous students are likely to be more effective as a whole, because of a more personal and focused nature of the learning process. By being autonomous, they are expected to be lifelong learners (Khaidir et al., 2020). Also, the skills necessary for language independent learning are similar to those they will need to apply in the future in the workplace.

According to Encyclopedia of the Sciences of Learning independent learning is a learning process or method implying that learners have control and ownership of their learning, act on their own, direct, and regulate their own learning. Independent learners are capable of setting goals, making decisions and choices, meeting their learning needs, taking responsibility for constructing and carrying out their learning, monitoring their progress, and self-assessing the learning outcomes (Livingston, 2012). Becoming an independent learner is a vital aspect of being a successful learner in general but this does not happen automatically although independent learning skills can be integrated into the English classroom step-by-step via different resources, for example, videos as a means of challenging students and providing relevant context (Westbrook, 2015). Some authors suggest creating an educative environment where students can cultivate their own self-regulative skills making use of role-play strategies during ESP speaking classes due to the fact that students are aware of the goals of learning, participate in goal-setting procedures, and apply classroom content creatively in role-play activities (Baranovskaya, Shaforostova, 2018). Students' independent learning can also be enhanced as a result of their critical thinking skills development through the project technology based on interaction, cooperation, and mutual aid instead of competition of learners (information and research projects, performance and organizational projects, survey projects, etc.) (Kopzhassarova et al., 2016). Gradual development of independent study skills by using certain scaffolding strategies will enable independent learners to feel confident and motivated (Martín de León, García Hermoso, 2020). Flipped classroom work with text material by means of the online cloud-based student response system Socrative, where students master types and strategies of reading as a part of independent learning skills formation, can significantly increase the educational, cognitive and communicative competencies of future specialists (Kulikova, 2020). Aminatun and Oktaviani (2019) offer to promote building independent learning skills outside the class with the use of the language learning application named Memrise which helps students learn English and especially improve their vocabulary whenever they want to, because they can be accessed anywhere and anytime.

Although much has been written about the importance of motivation and independent learning and the need for students to develop these skills, the question remains the same: how to do this, what conditions should be created for the idea implementation. Also, we should keep in mind that the insufficient level of psychological literacy of teachers, ignorance of modern educational and professional standards, and backwardness of teaching practices are among the factors that "can easily 'kill' students' motivation" (Aripova, 2021).

3. Materials and methods

Bachelor students of the Saint Petersburg Mining University start their Foreign Language course in their first year. During the 2020–2021 academic year a two-stage questionnaire survey was conducted to analyze the students' needs and interests in learning English. The survey was organized on a non-attributable basis using Google-forms.

The key research method is a questionnaire survey of students (N = 410) conducted in September 2020 and in May-June 2021. The participants were offered a set of 8 closed-ended questions concerning their English learning motivation and self-assessment of their success in this field. The research was carried out with the first-year engineering students of six different faculties. At the beginning of the academic year the Saint Petersburg Mining University students are to do a placement test according to which they are divided into study groups with a similar level of English. The experimental and control groups were formed by the randomization method. The experimental group (N = 223) consisted of students from fourteen B1+ study groups taught by the authors of the article where they could implement their teaching strategy. These students were offered a greater variety of activities aimed at motivation and independent learning skills development. The control group (N = 187) also included students from other fourteen B1+ study groups where classes were conducted by the colleagues of the authors. The students of this group studied English on the basis of the traditional language learning methods for technical universities in Russia.

The aim of the research was to determine the importance of the university subject for the students, to understand what language learning techniques the students are used to and what independent learning skills they have. It was organized not only to monitor the changes in the students' motivation, but also to get some feedback on the organization of the English classes in the university. The responses were measured on a 5-point Likert scale ('1' meaning 'I absolutely agree', '2' meaning 'I agree', '3' meaning I'm not sure', '4' meaning 'I disagree', '5' meaning 'I absolutely disagree'.

To evaluate the effectiveness of the proposed tools the validity and reliability of the responses were tested using STATISTICA Version 12 by StatSoft. The values of qualitative attributes are presented in the form of the observed frequencies and percentages. Pearson's chi-square test $\chi 2$ criterion was used to assess standard deviation between the experimental and control groups. With small frequencies ($> 5 \ldots < 10$) Yates's correction for continuity was used. For frequencies < 5, we used Fisher's exact test for four-field contingency tables. To assess the significance of within-group changes that occurred during the training period, the paired McNemar's test was used. When using the above-mentioned statistical criteria, we calculated the *P* value between the groups.

It should also be mentioned that the students indicated their preferred types of activities which were taken into consideration for working out a roadmap for developing their motivation and independent learning skills.

4. Results

To achieve the set goals the authors used personalised roadmaps for their first-year students based on a motivational spectrum including both extrinsic and intrinsic motivation and their relationships with various learning tools and core competences. The engineering student's motivational spectrum designed by the authors is presented in Figure 1.

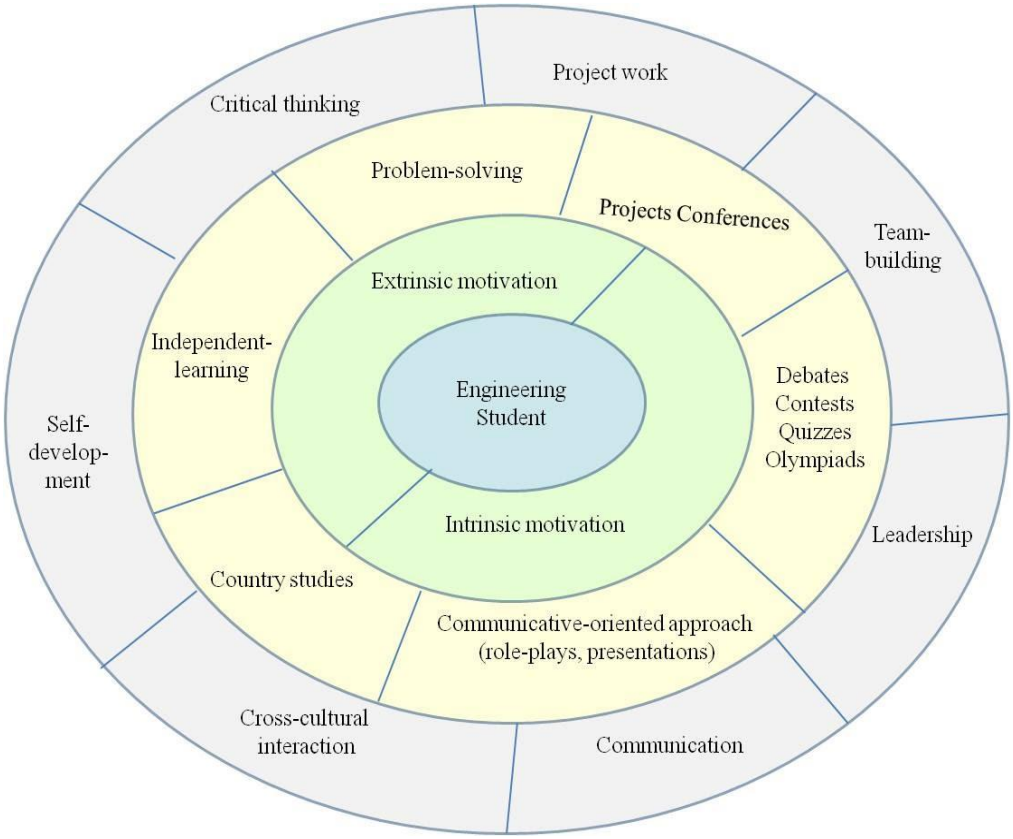

Fig. 1. Engineering student's motivational spectrum (compiled by Elvira Skornyakova)

To evaluate the impact of different learning tools on student's motivation the conducted survey additionally included a multiple choice question where students could choose up to 2 of their preferred activities in the English classroom (Figure 2).

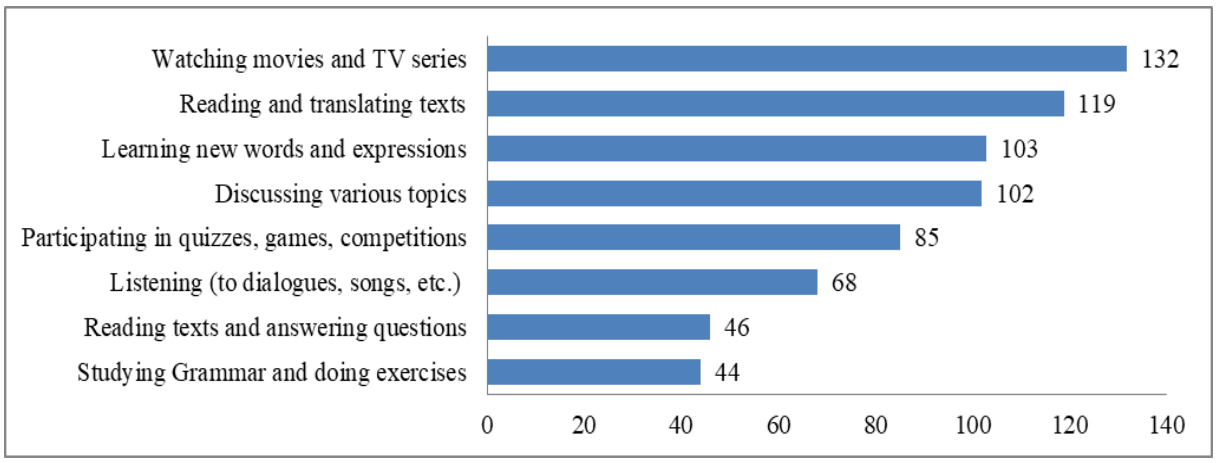

Fig. 2. What activities do you like most?

According to the authors' interpretation of the data in Picture 2 students enjoy watching films in English with subtitles (132 votes), vocabulary-building (103 votes), speaking activities and discussions (102 votes) that is activities that they find the most joyful and entertaining or those which can be done effortlessly (e.g. reading and translation of texts (119 votes)). On the other hand, most students dislike activities which are considered boring, monotonous and demanding like grammar drilling exercises (44 votes). Thus, working out a roadmap for motivation development the authors tried to select the most appropriate learning tools to enhance their engineering

students' engagement in the classroom via watching a lot of interesting videos and discussing topical problems, playing various language games and participating in communicative and problem solving activities.

According to the students' responses the following most effective learning tools were selected to develop their language skills and core competences:

- the students' critical thinking the authors applied problem-based learning tools for analysis of text, audio and video resources, as well as grammar explanation during classes;
- involving students in writing reports and making presentations improves their project work competence;
- team-building and
- leadership competencies acquisition can be achieved by means of students' engagement into mini-group discussions, participating in debates, contests, quizzes and Olympiads;
- further development of communication competence is carried out through the following learning tools: role plays, real life dialogues and business games which are based on communicative-oriented approach;
- to encourage the students' cross-cultural interaction the authors made use of various country studies materials and multimedia resources (modern pop-music, TV series, documentaries, etc.) for reconstructing a near-authentic learning environment;
- to stimulate the students' independent learning and self-development the authors provided a lot of helpful Internet resources, recommended language learning applications to build up vocabulary and practice grammar and encouraged the students to participate in language online contests and conferences.

The comparison of students' responses to a set of 8 closed-ended questions concerning their English learning motivation and self-assessment between the experimental group and the control group at the beginning and at the end of the 2020–2021 academic year made it possible to assess the effectiveness of the proposed teaching strategy.

The data analysis showed that before and after the use of personalized motivation roadmap and independent learning skills development there were no statistically significant differences between the experimental and control groups ($P > 0.05$). However, the share of 'I agree' responses increased statistically significantly, it was 1.31 times ($P = 0.006$) higher in the experimental group, and the share of 'I'm not sure' responses decreased: it was 1.66 times ($P = 0.002$) after the implementation of the proposed teaching methods. There were no statistically significant changes after the course in the control group ($P > 0.05$). Thus, these facts indicate a greater effectiveness of the suggested methods in the experimental group (Table 1).

Table 1. Question 1: I enjoy learning English

Groups	Scale points	September, 2020			May-June, 2021			Fold change	*P* value
		N	%	Standard Deviation	N	%	Standard Deviation		
Experimental group, n = 223	I absolutely agree	17	7.6 %	-	25	11.2 %	-	1.47	0.195
	I agree	94	42.2 %	-	123	55.2 %	-	1.31	**0.006**
	I'm not sure	73	32.7 %	-	44	19.7 %	-	-1.66	**0.002**
	I disagree	31	13.9 %	-	24	10.8 %	-	-1.29	0.313
	I absolutely disagree	8	3.6 %	-	7	3.1 %	-	-1.14	0.793
Control group, n = 187	I absolutely agree	15	8.0 %	0.881	19	10.2 %	0.732	1.27	0.472

Groups	Scale points	September, 2020			May-June, 2021			Fold change	*P* value
		N	%	Standard Deviation	N	%	Standard Deviation		
	I agree	79	42.2 %	0.985	88	47.1 %	0.102	1.11	0.349
	I'm not sure	54	28.9 %	0.400	42	22.5 %	0.499	-1.29	0.155
	I disagree	33	17.6 %	0.298	30	16.0 %	0.115	-1.10	0.679
	I absolutely disagree	6	3.2 %	0.833	8	4.3 %	0.541	1.33	0.586

The analysis of the data showed that before the course there were no significant differences between the experimental and control groups (P > 0.05). However, after the implementation of the developed roadmap the proportion of responses 'I absolutely agree' in the experimental group was 2.01 times higher than in the control group (P = 0.013), and the proportion of responses 'I disagree' in the experimental group was 2.05 times lower than in the control group (P = 0.003). Moreover, the share of 'I agree' responses increased statistically significantly by 1.34 times (P = 0.019) in the experimental group after the use of the personalized roadmap, and the share of 'I'm not sure' responses decreased: it was 1.43 times (P = 0.011). There were no significant changes after the course in the control group (P > 0.05). These facts demonstrate a greater effectiveness of the use of the suggested teaching methods in the experimental group (Table 2).

Table 2. Question 2: I'm satisfied with my progress

Groups	Scale points	September, 2020			May-June, 2021			Fold change	*P* value
		N	%	Standard Deviation	N	%	Standard Deviation		
Experimental group, n = 223	I absolutely agree	26	11.7 %	-	36	16.1 %	-	1.38	0.171
	I agree	71	31.8 %	-	95	42.6 %	-	1.34	**0.019**
	I'm not sure	83	37.2 %	-	58	26.0 %	-	-1.43	**0.011**
	I disagree	25	11.2 %	-	22	9.9 %	-	-1.14	0.644
	I absolutely disagree	18	8.1 %	-	12	5.4 %	-	-1.50	0.257
Control group, n = 187	I absolutely agree	18	9.6 %	0.508	15	8.0 %	**0.013**	-1.20	0.584
	I agree	65	34.8 %	0.532	73	39.0 %	0.465	1.12	0.391
	I'm not sure	63	33.7 %	0.457	53	28.3 %	0.596	-1.19	0.264
	I disagree	28	15.0 %	0.258	38	20.3 %	**0.003**	1.36	0.175
	I absolutely disagree	13	7.0 %	0.669	8	4.3 %	0.606	-1.63	0.261

The data analysis showed that before the use of personalized motivation roadmap and independent learning skills development statistically significant differences were observed between the experimental and control groups. Thus, the proportion of responses 'I absolutely agree' in the experimental group was 2.11 times higher (P = 0.001), the proportion of responses 'I disagree' in

the experimental group was 2.32 times lower (P = 0.001) and the proportion of responses 'I absolutely disagree' in the experimental group was 5.94 times lower (P < 0,001) than in the control group. This indicates that initial optimism in the experimental group was lower. However, after implementing the suggested methods the proportion of responses 'I absolutely agree' in the experimental group was no longer different from the control group (P > 0.05), while the proportion of responses 'I disagree' and 'I absolutely disagree' in the experimental group was still higher than in the control group. 1.91 times (P = 0.002) and 2.39 times (P = 0.033) respectively. In addition, the proportion of those who were not sure in the experimental group increased (P < 0.001). In addition, the share of 'I agree' responses decreased statistically significantly: it was 1.57 times (P = 0.015), and the share of 'I'm not sure' responses increased by 1.38 times (P = 0.013) in the experimental group after the use of the motivation and independent learning skills methods. There were no statistically significant changes after the use of these methods in the control group (P > 0.05). The combination of these facts also indicates a greater motivation level in the experimental group (Table 3).

Table 3. Question 3: Learning English takes a lot of time and effort

Groups	Scale points	September, 2020			May-June, 2021			Fold change	*P* value
		N	%	Standard Deviation	N	%	Standard Deviation		
Experimental group, n = 223	I absolutely agree	58	26.0 %	-	37	16.6 %	-	-1.57	**0.015**
	I agree	75	33.6 %	-	59	26.5 %	-	-1.27	0.098
	I'm not sure	66	29.6 %	-	91	40.8 %	-	1.38	**0.013**
	I disagree	20	9.0 %	-	28	12.6 %	-	1.40	0.222
	I absolutely disagree	4	1.8 %	-	8	3.6 %	-	2.00	0.242
Control group, n = 187	I absolutely agree	23	12.3 %	**0.001**	19	10.2 %	0.059	-1.21	0.512
	I agree	53	28.3 %	0.250	64	34.2 %	0.087	1.21	0.220
	I'm not sure	52	27.8 %	0.690	43	23.0 %	**0.000**	-1.21	0.285
	I disagree	39	20.9 %	**0.001**	45	24.1 %	**0.002**	1.15	0.457
	I absolutely disagree	20	10.7 %	**0.000**	16	8.6 %	**0.033**	-1.25	0.483

The analysis of the data showed that before the course there were no statistically significant differences between the experimental and control groups (P > 0.05). However, after the course the share of 'I agree' responses in the experimental group was 1.24 times higher than in the control group (P = 0.029). Moreover, in the experimental group after the course there was a statistically significant 1.40-fold (P = 0.001) increase in the proportion of 'I agree' responses, a 1.88-fold (P = 0.006) decrease in the proportion of 'I'm not sure' responses and a 2.00-fold (P = 0.009) decrease in 'I disagree' responses. There were no statistically significant changes after the course in the control group (P > 0.05). This also proves a greater effectiveness of the chosen roadmap for development of motivation and independent learning tools in the experimental group (Table 4).

Table 4. Question 4: Learning English is essential for my future professional expertise

Groups	Scale points	September, 2020			May-June, 2021			Fold change	*P* value
		N	%	Standard Deviation	N	%	Standard Deviation		
Experimental group, n = 223	I absolutely agree	44	19.7 %	-	49	22.0 %	-	1.11	0.560
	I agree	90	40.4 %	-	126	56.5 %	-	1.40	**0.001**
	I'm not sure	45	20.2 %	-	24	10.8 %	-	-1.88	**0.006**
	I disagree	36	16.1 %	-	18	8.1 %	-	-2.00	**0.009**
	I absolutely disagree	8	3.6 %	-	6	2.7 %	-	-1.33	0.587
Control group, n = 187	I absolutely agree	45	24.1 %	0.289	41	23.0 %	0.800	-1.04	0.817
	I agree	68	36.4 %	0.408	81	45.5 %	**0.029**	1.25	0.076
	I'm not sure	36	19.3 %	0.814	30	16.9 %	0.076	-1.14	0.552
	I disagree	32	17.1 %	0.793	22	12.4 %	0.155	-1.38	0.201
	I absolutely disagree	6	3.2 %	0.833	4	2.2 %	0.777	-1.43	0.574

The analysis of the data showed that before the course statistically significant differences were observed between the experimental and control groups. Thus, the share of 'I'm not sure' answers in the experimental group was 2.72 times lower ($P < 0.001$) than in the control group. This indicates an initial difference between the groups' respondents. However, after the course the proportion of responses 'I agree' in the experimental group was 1.26 times higher ($P = 0.023$), while the proportion of responses 'I'm not sure' in the experimental group was still 1.81 times lower than in the control group ($P = 0.015$). There were no statistically significant changes after the course in the experimental and control groups ($P > 0.05$). The combination of these facts suggests that the level of motivation and independent learning skills was approximately the same in the experimental and control groups (Table 5).

Table 5. Question 5: Learning English is necessary for personal needs (e.g. while travelling)

Groups	Scale points	September, 2020			May-June, 2021			Fold change	*P* value
		N	%	Standard Deviation	N	%	Standard Deviation		
Experimental group, n = 223	I absolutely agree	66	29.6 %	-	55	24.7 %	-	-1.20	0.241
	I agree	108	48.4 %	-	123	55.2 %	-	1.14	0.155
	I'm not sure	15	6.7 %	-	23	10.3 %	-	1.53	0.175
	I disagree	23	10.3 %	-	14	6.3 %	-	-1.64	0.122
	I absolutely disagree	11	4.9 %	-	8	3.6 %	-	-1.38	0.482

Control group, n = 187	I absolutely agree	53	28.3 %	0.780	56	29.9 %	0.231	1.06	0.733
	I agree	85	45.5 %	0.548	82	43.9 %	**0.023**	-1.04	0.755
	I'm not sure	34	18.2 %	**0.000**	35	18.7 %	**0.015**	1.03	0.894
	I disagree	11	5.9 %	0.105	9	4.8 %	0.521	-1.22	0.646
	I absolutely disagree	4	2.1 %	0.133	5	2.7 %	0.599	1.25	0.736

The analysis of the data showed that before the course statistically significant differences between the experimental and control groups were observed only in the share of 'I agree' answers; it was 1.54 times higher in the experimental group than in the control group (P = 0.037). However, after the course there were no longer statistically significant differences between the experimental and control groups (P > 0.05). Additionally, the share of 'I absolutely agree' answers statistically significantly increased by 1.42 times (P = 0.036), the share of 'I agree' answers increased by 1.62 times (P = 0.001) and the share of 'I'm not sure' answers decreased by 2.00 times (P < 0.001) in the experimental group after the course. However, similar changes after the course were also observed in the control group: the share of answers 'I agree' increased by 2.55 times (P < 0.001) and the share of answers 'I'm not sure' decreased by 2.00 times (P < 0.001). Thus, the results were approximately the same in the experimental and control groups (Table 6). The fact could be explained that most language learners recognize the importance of the subject for personal reasons like travelling or studying abroad.

Table 6. Question 6: Learning English fosters soft skills

Groups	Scale points	September, 2020			May-June, 2021			Fold change	*P* value
		N	%	Standard Deviation	N	%	Standard Deviation		
Experimental group, n = 233	I absolutely agree	45	20.2 %	-	64	28.7 %	-	1.42	**0.036**
	I agree	53	23.8 %	-	86	38.6 %	-	1.62	**0.001**
	I'm not sure	78	35.0 %	-	39	17.5 %	-	-2.00	**0.000**
	I disagree	36	16.1 %	-	29	13.0 %	-	-1.24	0.348
	I absolutely disagree	11	4.9 %	-	5	2.2 %	-	-2.20	0.127
Control group, n = 187	I absolutely agree	45	24.1 %	0.344	42	22.5 %	0.151	-1.07	0.713
	I agree	29	15.5 %	**0.037**	74	39.6 %	0.835	2.55	**0.000**
	I'm not sure	58	31.0 %	0.396	29	15.5 %	0.591	-2.00	**0.000**
	I disagree	40	21.4 %	0.173	35	18.7 %	0.112	-1.14	0.518
	I absolutely disagree	15	8.0 %	0.201	7	3.7 %	0.369	-2.14	0.079

The analysis of the data showed that before the course there were no statistically significant differences between the experimental and control groups (P > 0.05). However, after the course the proportion of 'I agree' responses in the experimental group was 1.84 times higher than in the control group (P = 0.002), and the proportion of doubting respondents was 1.63 times higher in the control group (P = 0.002). In addition, the share of 'I agree' responses increased statistically significantly by 1.29 times (P = 0.033) in the experimental group and the share of 'I disagree' responses decreased by 1.56 times (P = 0.010). There were no statistically significant changes after the course in the control group (P > 0.05). It is possible to state a greater effectiveness of the suggested methods in the experimental group (Table 7).

Table 7. Question 7: I am interested in culture and traditions of English-speaking countries

Groups	Scale points	September, 2020			May-June, 2021			Fold change	*P* value
		N	%	Standard Deviation	N	%	Standard Deviation		
Experimental group, n = 223	I absolutely agree	23	10.3 %	-	33	14.8 %	-	1.43	0.153
	I agree	76	34.1 %	-	98	43.9 %	-	1.29	**0.033**
	I'm not sure	55	24.7 %	-	49	22.0 %	-	-1.12	0.502
	I disagree	64	28.7 %	-	41	18.4 %	-	-1.56	**0.010**
	I absolutely disagree	5	2.2 %	-	2	0.9 %	-	-2.50	0.253
Control group, n = 187	I absolutely agree	21	11.2 %	0.765	20	10.7 %	0.217	-1.05	0.869
	I agree	69	36.9 %	0.552	54	28.9 %	**0.002**	-1.28	0.099
	I'm not sure	54	28.9 %	0.336	67	35.8 %	**0.002**	1.24	0.151
	I disagree	39	20.9 %	0.068	41	21.9 %	0.372	1.05	0.801
	I absolutely disagree	4	2.1 %	0.943	5	2.7 %	0.167	1.25	0.736

The analysis of the data showed that before the course there were no statistically significant differences between the experimental and control groups (P > 0.05). However, after the course the proportion of 'I agree' responses in the experimental group was 1.30 times higher than in the control group (P = 0.013), and the proportion of doubting respondents was 2.38 times higher in the control group (P = 0.002). Moreover, the share of 'I agree' responses increased statistically by 1.31 times (P = 0.008) in the experimental group after the course and the share of 'I'm not sure' responses decreased by 2.57 times (P < 0.001). There were no statistically significant changes after the course in the control group (P > 0.05). It leads us to the conclusion that the motivation level of the students in the experimental group after the course was higher (Table 8).

Thus, the results of the statistical analysis showed that the responses to six of the eight questions in the questionnaire demonstrate a clear advantage of the chosen teaching methods used in the experimental group.

Table 8. Question 8: When the University course of English is over, I'm going to continue learning English

Groups	Scale points	September, 2020			May-June, 2021			Fold change	*P* value
		N	%	Standard Deviation	N	%	Standard Deviation		
Experimental group, n = 223	I absolutely agree	59	26.5 %	-	69	30.9 %	-	1.17	0.295
	I agree	90	40.4 %	-	118	52.9 %	-	1.31	**0.008**
	I'm not sure	44	19.7 %	-	16	7.2 %	-	-2.75	**0.000**
	I disagree	21	9.4 %	-	14	6.3 %	-	-1.50	0.218
	I absolutely disagree	9	4.0 %	-	6	2.7 %	-	-1.50	0.431
Control group, n = 187	I absolutely agree	54	28.9 %	0.585	57	30.5 %	0.920	1.06	0.734
	I agree	71	38.0 %	0.621	76	40.6 %	**0.013**	1.07	0.597
	I'm not sure	28	15.0 %	0.207	32	17.1 %	**0.002**	1.14	0.573
	I disagree	23	12.3 %	0.348	14	7.5 %	0.629	-1.64	0.119
	I absolutely disagree	11	5.9 %	0.387	8	4.3 %	0.378	-1.38	0.480

5. Conclusion

The survey data confirmed that there is a dichotomy between the students' attitude to the subject and their ability to study on their own, i.e. in spite of the fact that most students enjoy learning English; they claim that it takes much time and energy. It means that the first-year students' independent learning skills are not developed enough and along with the limited number of academic hours in technical universities for classroom activities it can be an obstacle to their progress. The peculiarity of the discipline is that it is a really time-intensive process which requires much effort from students. Language learners who are eager to succeed in mastering a second language are expected to practice their language skills more often and regularly and increase workload and the level of difficulty step by step as the process requires memorizing new words to expand one's vocabulary and doing a great number of various skill-building exercises. Therefore, foreign language teachers should spend more time on developing students' motivation and their independent learning skills.

This study aimed at developing the teaching tools to enhance students' motivation and independent learning skills showed that the proposed strategy proved quite effective. At the end of the 2020–2021 academic year the students in the experimental group reflected on their experiences during the course. They pointed out that they had a greater satisfaction with the tools used in their English classes and highly appreciated the expertise of their teachers. The students also stated that face-to-face tutorials with their teachers were also significant for their progress. They claimed that communicative activities and gamification were consequential for their involvement and motivation. But they also understood the importance of finding more time for grammar practice: learning rules, doing exercises and analyzing mistakes. More students got interested in the culture and traditions of the English speaking countries. They were better at finding the information they needed in a foreign language using different resources. Taking part in a variety of activities presented in the motivational spectrum made students more confident and skillful in using self-development techniques, managing their time more effectively and. in the long

run, being more independent learners. The share of students who see the correlation between the knowledge of English and a successful career has increased by 18 % in the experimental group which laid a good foundation for starting the ESP course next term.

6. Limitations

In this study, we also recognized some limitations. Firstly, the analysis of the suggested roadmap was implemented within the scope of all the above mentioned tools; we have not thoroughly studied the level of efficacy of each learning tool separately. Secondly, the authors conducted the experiment only with first-year Bachelor students who studied the course of General English. Thirdly, there was no special selection of the participants into experimental and control groups apart from their English proficiency level and age. As previously stated, it was a random choice of the fourteen B1+ study groups (the experimental group) taught by the authors and the fourteen B1+ study groups taught by their colleagues.

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