

## **Extracurricular activity of engineering students: trends and motives**

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### **Abstract**

The purpose of the article is to develop scientifically applied recommendations on the motivation of students to participate in the extra-curricular activities of universities. To conduct the pedagogical experiment, author's questionnaire was developed. The pedagogical experiment was conducted for students of engineering and technical specialties. The authors concluded the necessity improvement of extra-curricular work with engineering students. Three main directions of such improvement were identified: informing, profiling, motivation. The authors have proposed to initiate the development of interdisciplinary projects that extend the boundaries of inter-faculty interaction and provide for the integration of the classroom and extracurricular work of the university.

*Keywords:* higher education institution; extra-curricular activities; economic digitization; internationalization of scientific and educational space; engineering students; soft skills; hard skills

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### **1. Introduction**

In the era of digitalization (informatization) of the economy and internationalization (globalization) of the scientific and educational space, modern universities face a number of challenges related to the training of future specialists (Crişan, 2019). First, the primary objective is to prepare students who are competitive both in the domestic and global labor markets. This places new demands on the context, structure and content of curriculums and didactic materials. In particular, they should be flexible, coordinated with employers, and include competency-building modules required in the domestic and global labor markets. Second, the modern educational process in universities cannot be guided by the formation of hard-skills in students only. Soft skills staff acquire particular relevance in the 21st century (Sorina, Roman & Vac, 2019). Third, there is a gradual decrease in the classroom load, which in turn causes the role of extracurricular work with students to grow. In such circumstances, the problem of effective motivation of students to participate in extra-curricular activities of the university arises.

### **2. Methodology**

#### *2.1. Objective*

The *objective* of the article is to develop scientifically applied recommendations on the students' motivation to participate in extra-curricular activities of higher education institutions.

*Research Hypotheses.* Digitalization of the educational space necessitates the transformation of approaches for training by universities of the highly qualified staff, which are competitive in today's labor markets. Given limitations of the classroom workload, the role of extra-curricular activity of the higher education institution and its contribution to the development of hard-skills and soft-skills of engineering

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students is being updated. Because of this, the following research hypotheses are put forward:

- in the context of digitalization of society and economy the labor market requiring much more engineering specialist; more over the demand on highly qualified engineering specialists will increase in the nearest decade;
- the competitiveness of engineering students at the labor market depends on the development level of their hard-skills and soft-skills;
- the extracurricular activities of higher education institutions have a significant and positive influence on the professional competence of engineering students

## 2.2. Participants

The pedagogical experiment was conducted on the basis of the National University "Chernihiv Polytechnic" (city – Chernihiv, country - Ukraine) with observance of all ethical norms regarding the respondents. Sampling was formed by students of engineering and technical specialties of the Faculty of Electronic and Information Technologies, the Faculty of Mechanical and Technological Engineering, as well as the Educational and Scientific Institute of Mechanical Engineering, Technology and Transport of the University. Sampling included engineering students in the third year of undergraduate programs, since they are already familiar with the specifics of the chosen profession, required professional competences, features of extracurricular work and were able to participate in extracurricular activities of the university. The research was conducted during 2018-2019.

## 2.3. Instrument

The following general scientific and specific research methods were used to achieve this goal:

- methods of analysis and synthesis - to study scientific approaches in order to determine the nature of extra-curricular work; generalization of scientific approaches to students' motivation to participate in extra-curricular activities;
- methods of pedagogical observation, questionnaires, interviews - to identify the level of students involvement in extracurricular activities of higher education institutions, as well as the willingness to activate and diversify their participation.

For the pedagogical experiment, we developed an author's questionnaire consisting of 33 questions, namely: 3 general questions (determining the gender of the respondents, year of study, educational qualification level and faculty) and 30 narrow-profile questions (to determine the parameters of student participation in extra-curricular activities). The author's questionnaire lists both closed and open questions. In addition, the author's questionnaire was supplemented by a survey aimed at determining the degree of the development of soft-skills in students, including creative thinking (15 questions), stress resistance (20 questions), communication skills (15 questions), leadership skills (10 questions), teamwork skills (11 questions). Informal interviews were also conducted with respondents to determine their desire to increase their involvement in extra-curricular activities.

## 2.4. Procedure

*Validity and reliability.* Validity and reliability of the research data is ensured by the fact that the level of formation of the respondents' hard & soft-skills and their willingness to develop them in extracurricular work have been tested by different methods (questionnaire, pedagogical observation, interview, expert opinion), the results of which are the same.

*Ethical principles of research.* Participants of the pedagogical experiment agreed to participate in it without pressure and signed the consent to participate. The experiment was conducted in compliance with all ethical requirements

## 2.5. Data analysis

To analyze the research results we used the following methods:

- method of statistical analysis - for quantitative and qualitative analysis of the obtained research results;
- visualization method - for graphical interpretation of the obtained research results.

## 2.6. Literature Review

The problem of students' motivation to study is one of the most elaborated in the scientific literature, since it is relevant for the issue urgent for all universities. Aspects of students' motivation are studied by the following scientists: Figas P., Hagel G., Bartel A. (2013) and Zimmerman B. (2008) In the context of our study, the paper Kirn A., Benson L. (2013), dedicated to quantitative evaluation of the students' motivation, is of great interest.

To increase students' interest in the educational process, a number of educational researchers suggest the use of active learning methods. Features of gamification of the educational process are revealed by Hsieh T., Huang H. (2014) and Boghian I., Cojocariu V.-M., Popescu C.V., Măță L.(2019). The specificity of the application of active learning methods in the preparation of engineering students is studied by Raud Z., Vodovozov V., Aksjonov A., Petlencov E. (2015-2017). Problem-based learning is the object of research by Spronken-Smith R., Harland T. (2009). Trends in the digitization of the educational space are relevant to the study of the peculiarities of implementation of information and communication technologies and modern software in the educational process of higher education institutions (Ye & Peng, 2004; Damșa, 2019). In addition, Balgiu B. (2018) conducted a highly qualified analysis of creativity styles used by computer science students, and concluded that highly creative subjects are able to produce novelty by perfecting information and modernization of existing objects.

Bovill C., Cook-Sather A., Felten P. (2011) and Cavanagh M. (2011) increase students' motivation to engage students by organizing and conducting lectures and seminars. In particular, students are seen as partners of teachers in developing a teaching approach, course design, curricula (Bovillm Cook-Sather & Felten, 2011).

In our opinion, extracurricular activities at universities have significant potential for enhancing students' interest in learning. A systematic overview of approaches to interpreting the nature of extra-curricular activities is provided in the article of Bartkus K., Nemelka M. (2012). Various forms of extra-curricular work with the youth are revealed by Eccles J., Barber B. (1999; 2003). The interconnection between extra-curricular activities, learning activities, academic outcomes is illustrated in the article by Clegg S., Stevenson J., Willot J. (2010). The impact of the number, variety, and frequency of extra-curricular activities on the formation of personality of future professionals (Fredricks & Eccles, 2006) and on their academic success is also described in the scientific literature (Wang & Shiveley, 2009; Stuart, Lido & Morgan, 2011; Seow & Pan, 2014).

Various aspects of organizing and conducting extracurricular work of higher education institutions are disclosed in scientific publications: assessing the impact of extra-curricular activities on the formation of interpersonal skills (Rubin, Bommer & Baldwin, 2002); assessment of participation in extra-curricular activities in CVs (Nemanick & Clark, 2002); the role of extra-curricular activities in active citizenship education (Keser, Akar & Yildirim, 2011); the link between participation in extra-curricular activities and beneficial outcomes (Fredricks & Eccles, 2006; Chan, 2016) etc. Staff conceptions of extra-curricular activities in universities are presented in the paper of Clegg S., Stevenson J. and Willot J. (2010).

While appreciating scientific achievements of the above-mentioned scientists, it should be noted that theoretical, methodological and applied aspects of motivating students of engineering specialties to intensify their participation in extra-curricular

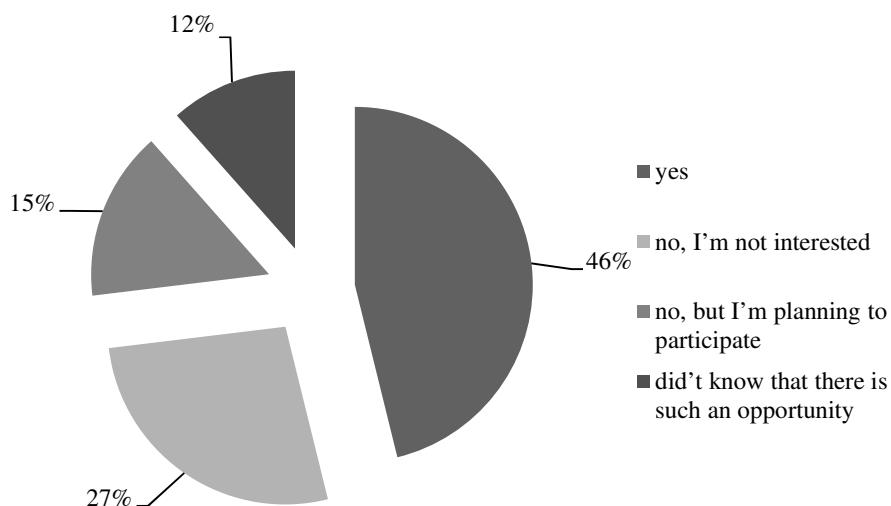
activities of the university remain insufficiently studied. This substantiates the relevance of this article, confirms its theoretical and practical significance.

### 3. Results

#### 3.1. Parameters of participation of engineering students in extra-curricular activity of the university

Of the total number of respondents, 46% participated in the extra-curricular activities of the university (see Figure 1), that is 27% of engineering students surveyed, state their disinterest in participating in extracurricular activities. It is important to note that 15% stated their desire to participate in extra-curricular work, and 12% were unaware of the possibility of such participation. On this basis, it should be emphasized that pedagogical stimulation should be diversified and targeted at least at 3 categories of students:

- engineering student involved in extra-curricular activities - incentives to continue such activities;
- engineering students who do not know and want to be engaged in extra-curricular activities; - informing and motivating them to participate in extra-curricular activities;
- engineering students who are not interested in participating in extra-curricular activities - informing about the benefits of extra-curricular participants.



**Figure 1.** Distribution of respondents' answers to questions about the experience of participating in extra-curricular activities of the University

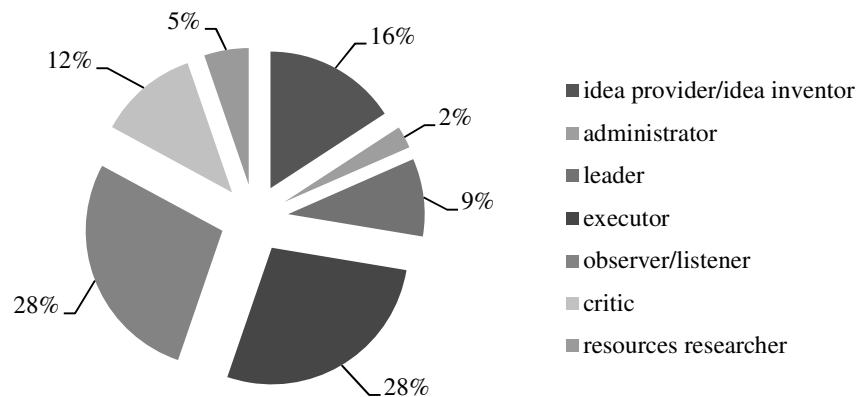
Table 1 details the forms of extra-curricular work in which engineering students of the National University of “Chernihiv Polytechnic” as participants were involved. The table shows that almost 33% of the respondents who reported having extra-curricular experience were involved in the work of the student councils of the university or its separate structural units. However, it should be understood that due to the lack of regulation by the faculty and the administration of the university, student self-government rarely takes care of the formation of the professional competencies of participants in their activities. Instead, extra-curricular activities of the university, organized by scientific-pedagogical staff, are always focused on the development of hard and soft-skills of students.

**Table 1.** Distribution of respondents' answers to questions about forms of extra-curricular activities of the university in which they participated

4. Form of the extra-curricular activity	% of respondents
participation in student Olympiads, thematic intellectual games, research and practical conferences	17,31
participation in the work of the student council of the university / institute / faculty	32,69
participation in the work of student professional-oriented associations (student social service, volunteer center, law clinic, psychological service of the university, etc.)	1,92
participation in the work of a student PR-agency	1,92
participation in projects	13,46
participation in trainings	9,62
student creative / sports clubs and hobby groups	19,23

As the survey showed, an unjustifiably small proportion of engineering students participate in the work of student professional-oriented associations (1.92% of respondents) or at the university's PR agency (1.92%). Only 9.62% of those polled participated in trainings; 13.46% - participated in the implementation of projects. In our opinion, it is in these areas, first of all, that the activity of teachers to motivate students to participate in extra-curricular activities of the university should be focused.

It is significant that with such low participation of engineering students in extra-curricular activities of the university, only 16% of them acted as an idea generator and 9% as a leader (see Figure 2). Most of the respondents were performers (28%) or observers / listeners (28%). A pedagogical experiment conducted with students in the humanities showed dramatically different results: high level of the involvement in extra-curricular activities of the university, including high participation as generators of ideas and leaders. Considering the results of the questionnaire, we can note the relevance of the inclusion in extra-curricular activities of engineering students blocks to develop their leadership and creativity.



**Figure 2.** Distribution of respondents' answers to questions about their role in extra-curricular activities

During the survey, respondents were asked a question "Rate from 1 to 5 how helpful engaging in extracurricular work is to your personal and professional growth." 38.46% of respondents rated it at 4 points, and 32.69% - at 3 points. Only about 19% of survey participants scored the highest "5" in response to this question. Therefore, we can state that engineering students are aware of the role of extra-curricular activities in the professional attitude of future specialists. However, they tend to

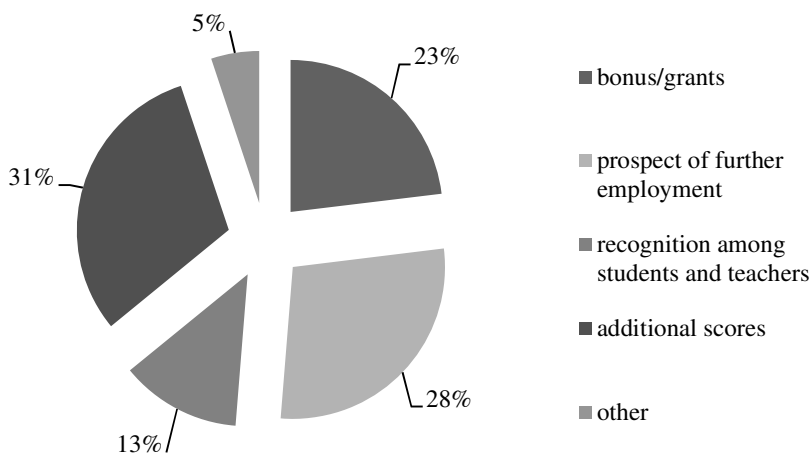
underestimate the importance of soft-skills formed in the course of extra-curricular activities for their profession.

### 3.2. Research of motives of the engineering students participation in extra-curricular activities of the university

We have defined the attitude of engineering students to the extra-curricular activities they are involved in while studying at university. More than 40% of those surveyed said that participating in extra-curricular activities is an opportunity for them to earn extra points before evaluating their academic performance. About 36.5% of the respondents said that participating in such events brought them new acquaintances and widened their circle of friends. Fewer than 30% of the students surveyed reported that they practice their leadership and teamwork skills in extra-curricular activities. Up to 29% of those surveyed perceive participation in extra-curricular activities as an experience useful for their further professional development.

The results analysis also revealed some negative effects. In particular, more than 17% of engineering students responded that participating in extra-curricular activities is a reason for them to miss classes. Only 19% of respondents perceive extra-curricular activity at the university as a manifestation of inner desire that is very satisfying.

Figure 3 and Figure 4 summarize the engineering students' views on the motivators behind their participation in extra-curricular activities. The figures show that it is important for students to receive the benefits of participating in extra-curricular activities (additional points to the final grade in the course). In the second place, among the means of motivation, the respondents noted the prospects of further employment; in the third place - a material reward (awards, scholarships).



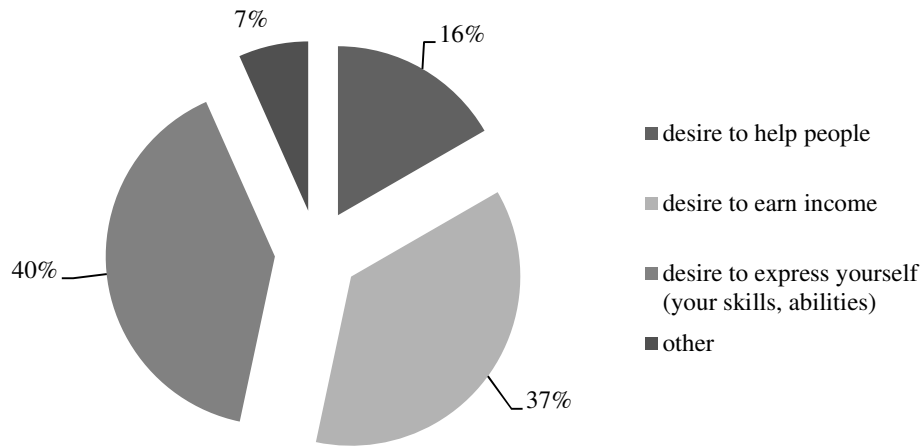
**Figure 3.** Distribution of the respondents' answers to the question "What motivation will encourage you to participate in the extra-curricular activity?"

From the above we can draw the following intermediate conclusions:

- informing students about the benefits of participating in extra-curricular activities of the university;
- strengthening a component aimed at the development of students' professional competences in the structure of programs of extra-curricular activities;
- expanding the system of tools for engineering students to participate in extra-curricular activities, in particular by enrolling additional points in the final assessment of individual subjects or awarding extra-curricular participants.

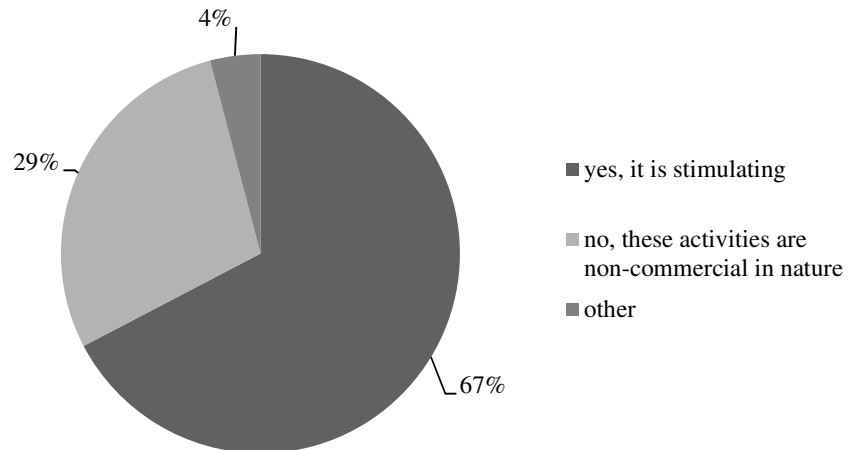
As can be seen from Fig. 4, it is important for engineering students to get concrete results from the implementation of non-audit activities - income or opportunity to test their professional skills and abilities in practice. For 17% of respondents, the main incentive to participate in extra-curricular projects is the desire to help people. For

comparison, students at the university's humanities specialties want to help people come first in incentives to participate in extra-curricular activities; whereas they give lower priority to material gain.



**Figure 4.** Distribution of respondents' answers to the question "What is the main incentive for you to participate in extra-curricular projects?"

The survey results correlate with the respondents' answers to the question of the importance to be paid for activities in the context of extra-audit activities (see Figure 5). Most respondents (67%) said that having a payday is a powerful enough incentive to participate in extra-curricular activities. In this context it is worth noting an interesting fact: 90.39% of the respondents already have experience of paid work (61.54% - not by profession; 28,85% - by specialty). Therefore, we again conclude on the urgency of the transformation of approaches to motivate engineering students to participate in extra-curricular activities - in the direction of strengthening the applied nature of such measures, increasing their focus on the development of professional competencies, expanding tools for stimulating the youth.



**Figure 5.** Distribution of respondents' answers to questions about the importance of receiving remuneration for extra-curricular activities

*Limitations.* During the pedagogical experiment we conducted a survey of engineering students of the National University of "Chernihiv Polytechnic". As a

result, we determined students' attitudes toward extra-curricular activities, the frequency of their participation in extracurricular activities, the most interesting forms of such work, as well as the desired incentives for engaging in the extra-curricular work of a higher education institution. Accordingly, one of the limitations of our study is the subjectivity inherent in the respondents' answers. In addition, the results obtained are also significantly influenced by students' self-esteem.

#### **4. Discussions**

We agree with Eccles J. (2003) that, through the human interaction skills acquired during extra-curricular activities, students demonstrate better learning outcomes. Brown R. also states this position, noting that participants in extra-curricular activities demonstrate better test results in academic disciplines. We believe that the above needs clarification. In particular, additional incentives to engage them in extra-curricular projects should be created for modern students. In addition, they need to be offered an expanded system of forms of extra-curricular activities at the university.

Appearing in the United States (Yale University, Harvard University) in the nineteenth century, the extra-curricular activity has changed significantly in the direction of expanding its forms. Over time, literacy clubs have been supplemented by interest clubs, arts, sports clubs (basketball, athletics, gymnastics, football, baseball, dance, etc.). Nowadays, the variety of forms of extra-curricular activities is much larger and mostly dependent on the specifics of the higher education institution and the specialty that students acquire. In addition, some young people may be interested in participating in extra-curricular activities that do not directly relate to their chosen specialty, or participate in several extra-curricular activities. According to the study by Reeves D. (2008), students participating in more than one extra-curricular activity show an order of magnitude higher in learning and communication than young people who are not involved in the extra-curricular activities of the university at all.

Results of our pedagogical experiment at the National University of "Chernihiv Polytechnic" are consistent with the results of the study by Reeves D. (2008), and Massoni E. (2011). In particular, these are the identified effects of extra-curricular activities, namely: positive influence on the formation of students' personal and professional qualities (Massoni, 2011); potentially negative impact on student performance (by shifting learning activities to extra-curricular activities, less attention, and time to study) (Reeves, 2008). Therefore, we can note the relevance of the results of the pedagogical experiment we received and their consistency with the results of studies obtained by foreign scientists.

At the same time, it should be noted that the scientific publications we analyze focus on only one aspect of the extra-curricular activity of a higher education institution. Instead, our study emphasizes the interdisciplinary nature of extra-curricular activities. In addition, unlike the scientific publications analyzed, we have set ourselves a research question - to identify effective tools for student motivation for the extra-curricular activity. Moreover, we have chosen for the research a rather specific target audience - engineering students, characterized by low social activity and a high desire for practical results from their activities (bonuses, points, bonuses, scholarships, surcharges, etc.).

#### **5. Conclusion**

Summarizing the research results, we can distinguish three main areas in which it is advisable to improve the programs of extra-curricular activities:

- 1) information - improvement of traffic channels and ways of presenting information on extra-curricular activities to engineering students;
- 2) profiling - deepening extra-curricular programs by incorporating the components of engineering students' professional competencies;
- 3) motivation - expanding the system of moral and material incentives for engineering students to participate in extra-curricular activities.



As for the first direction, it is worth emphasizing the relevance of modernization of communication channels - use of the power of university sites, active use of social networks popular among the youth audience (Facebook, Twitter, Instagram, etc.). It is also advisable to change the way in which information is presented to modern youth, which is mainly related to the so-called "Y-generation". Printed ads near dean offices are not able to interest students; posts on social networks about organizing and conducting extracurricular events should contain little text material, have illustrated inserts, and call for action; high interest among young people is caused by audio and video information.

Regarding the second direction of improving extra-curricular activity with engineering students, we can emphasize the importance of using active learning methods, gamification, methods of simulation and stimulation games in the obligatory organization of feedback from participants in extracurricular events. The process of conducting extra-curricular activities should be interesting for students, as well as aimed at developing their soft-skills and hard-skills. In this perspective it is advisable to note the need to diversify forms of extra-curricular work of the university. Among modern forms we can name clubs of intellectual youth, agency of social projects, schools of tutors, schools of training, association of volunteers, various clubs of interests, etc. Traditional forms of extra-curricular work can be combined with modern ones, as well as complemented by the use of pedagogical innovations and the latest information and communication technologies.

In our opinion, the most promising form of extra-curricular activity is interdisciplinary projects, which involve students from different faculties and specialties. Advantages of interdisciplinary projects as a prospect form of university extra-curricular activity are the following:

- development of students' communication skills, their teamwork skills, leadership skills;
- development of the ability to make decisions and find creative ways to solve common problems;
- development of students' professional competences in the course of fulfilling their assigned project tasks;
- development of inter-faculty interaction;
- high interest of students due to the presence of concrete results of the completed work.

In our opinion, the third direction of the improvement of extra-curricular activity with engineering students needs special attention. The following are the methods of moral motivation, namely: placement of the most active students on the Honors Board of the "Best University Students"; creation of a section "Pride of the University" in student media (student radio, newspaper, television), where information on activists will be covered periodically; creation of social networks in groups dedicated to different areas of extra-curricular activities, where information about students' activities, their achievements, photos from various events, etc. will be posted; awarding the best students with diploma and title "the student of the year", "pride of the university", etc.; extra points by passing tests and exams; exemption from performing certain educational tasks in subjects; thanks from partner organizations for extra-curricular activities; acknowledgment with the record in personal file; a record in the graduate's personal information file of all his achievements in extra-curricular activities. Material incentives include awarding the best students; personal scholarship; delegation to exhibitions, roundtables, press conferences, training programs, exchange programs, etc., the topics of which directly relate to the field of extra-curricular work that the student is engaged in; rewarding with valuable gifts, cups, medals, etc. memorabilia; material reward for winning competitions and more. Methods of moral and material motivation should be combined and modified in response to students' reaction to them. However, when working with engineering students, one must keep in mind the importance of benefits for them.

We would like to emphasize separately the feasibility of integrating classroom and extra-curricular work with engineering students. The theoretical knowledge obtained in the classroom should be practically implemented in the course of extra-curricular

activities. All extra-curricular activities should be aimed not at organizing students' cultural leisure, but at developing professionally important skills and qualities of engineering students.

Prospects for further research include the implementation of interdisciplinary projects in the framework of the extra-curricular activities of the university, as well as an assessment of the impact of participation in them on the formation of soft-skills and hard-skills of engineering students of the university.

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