

STUDENT CONFERENCE FOR THE DEVELOPMENT OF SUCCESSFUL SOFT SKILLS

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Abstract

The XXI. in addition to 20th-century engineering competencies and professional knowledge, using so-called soft skills in everyday work processes is essential. Among these soft skills, countless can be listed, including communication, language, problem-solving, and presentation techniques. In the tasks performed in the technical fields, starting from the middle management level, using tools to transfer information, such as PowerPoint presentations, has become commonplace. In order to develop engineering students in this direction, the curriculum at John von Neumann University does not explicitly include presentation-making as a subject. However, this ability has been developed in many ways within or outside the framework of a lesson. To this end, we are launching an optional subject for first-year students, where they can choose from two tasks or solve a research or project task related to the field of study. At the end of the project, they presented their results at a conference covering the entire year, at which nearly 25 topics were presented, and nearly 100 people participated. Every year, the conference is organized around a theme (Industry 4.0, sustainability), and during the presentation of the chosen theme, special attention is paid to its connection to the theme. During the task, the students acquire countless skills and practices that help them to be more confident in carrying out a project, making a presentation, and giving a presentation during their university studies and later in their work.

1 Soft skills and competences for 21st century engineers

The rapid development of industry and technology is increasing the emphasis on technical knowledge and professional competencies and developing soft skills. In the 21st century, a significant part of the university education of engineers should be skills and competencies that go beyond traditional technical knowledge and contribute to a successful position in the labor market. The most commonly listed soft skills and competencies in engineering education are communication skills, teamwork and collaboration, problem-solving and critical thinking, leadership skills, intercultural competence, ethical responsibility, and social awareness, but also learning skills, since on the one hand, in many cases, different methods and expectations are typical of public and higher education. On the other hand, the ability to engage in lifelong learning is of crucial importance for

engineers due to the rapid pace of technological development and industrial innovation [5] [7] [15]; [10] [17] [1] [13]. The competencies listed above are often referred to in the literature as holistic competencies, which are relevant to their employability and personal development [1] [19].

The importance of communication skills is crucial in all aspects of life. Engineers most often work in teams where they have to interact effectively with professionals from different disciplines. Clear and effective communication helps to ensure successful project implementation. Good communication skills include written and verbal expression, presentation skills, and listening and giving feedback [2] [11] [14]. Teamwork is critical in engineering projects. Successful engineers can collaborate effectively with others, share ideas, and work together to solve problems. When developing teamwork, building trust, understanding common goals, and learning conflict management strategies are essential [12] [18].

Every day, engineers face complex problems that require creative and innovative solutions. Critical thinking and problem-solving skills allow them to analyze situations, identify possible solutions, and select the most appropriate one. In developing these skills, engineering students learn to apply logic and analytical thinking to real-world situations [4] [16]. Engineers' decisions often have a significant impact on society and the environment. Developing ethical responsibility and social awareness helps engineers make decisions responsibly and sustainably, considering long-term consequences [23]. Leadership skills include decision-making, motivating people, strategic planning, and time management. Developing leadership skills helps engineers effectively manage their teams and projects [9].

Developing the soft skills of engineering students is critical in the 21st century, as these skills significantly contribute to professional success and competitiveness in the labor market. There are many effective methods and practices for developing soft skills. One of the most prominent is Project-Based Learning (PBL), where students focus on solving real-world problems, working in teams, and developing their communication, collaboration, and problem-solving skills. This method also promotes acquiring practical experience and applying theoretical knowledge [3]. Many institutions offer opportunities for interdisciplinary projects, such as vehicle-building competitions, where students from different disciplines work together to build and race a successful vehicle. Mentoring programs allow students to learn from and receive feedback from experienced professionals and faculty [8] [20]. Mentors can help students develop personally and professionally and commit to lifelong learning [6] [21]. These programs help students understand their strengths and weaknesses and develop their capacity for self-reflection and personal development.

2 Presentation of the mentoring program at the John von Neumann University

At John von Neumann University, we launched the Student Achievement Mentoring Program in September 2023 to support first-year BSc students. The mentoring program students integrate into the university provides information and advice on taking and succeeding in their courses and supports their progression through the curriculum. Students are helped to identify their strengths and to achieve their best professionally, socially, and individually during their university studies, as the university is about building a foundation for the future. The mentoring program is designed to support students' success, help them integrate into the university community, reduce drop-out rates, and support their professional learning.

This academic year, we had 17 mentor groups, each supported by a mentor teacher and a senior mentor student. Each mentor group usually includes 20-28 students in the same subject. An essential aspect of the program is that the mentored students receive support not only from their teachers but also from their fellow mentor students. The autumn and spring semesters program is different, as the first semester focuses more on integration and the second on professional development.

In this paper, we would like to show how professional mentoring in the spring semester aims to develop students' soft skills and holistic competencies through the processes and themes. Professional mentoring can be seen as a knowledge-building discourse in which knowledge-building is achieved through complex interactions involving the participants, distributing tasks and activities within the working group, and sharing and monitoring progress.

3 Introducing the Mentor Conference

In May 2024, for the second time, the Faculty of Engineering of John von Neumann University organized the Student Success Mentoring Conference, which focused on talent management and professional mentoring in the spring semester within the Student Success Mentoring Program framework. During the semester, students participated in professional research and project work as part of an elective course. At the end of the semester, they presented the results of their work at a faculty conference. In this way, they not only deepened their professional knowledge in a particular field but also got a taste of real-life research project work and teamwork with the help of their mentor teachers. On both occasions, the conference featured 28 presentations in four sections: logistics, computer engineering, automotive engineering, and mechanical engineering. Each presentation resulted from a team effort of 3-5 people. Following the model of the professional conferences, students pre-registered for the conference with their presentation topic and abstract, prepared their presentations using the central design elements of the conference, and presented their results after the conference's opening by the Dean of the Faculty, according to the program booklet.

To participate in the conference, students had to take a research or project course led by a mentor teacher during the semester. The course gives students a basic understanding of research methodology and how to set up and carry out a project. In addition, the tutors will organize various professional and social activities for the students, such as visiting a factory or even playing board games and pizza. Table 1 shows a sample of the most essential elements of the theme.

Table 1. Main content of the course required for conference participation

Name of the subject:	Mentoring: sustainable solutions for freight transport - Research
Goal of the subject:	<i>The student will gain practical experience in the field of research, integrate into the research workshop of the Logistics Engineering Department and, prepare for the work of the Scientific Student.</i>
Knowledge to be acquired:	<i>Learning about literary research techniques. Understanding and confident use of article databases. Knowledge of research areas, with a particular focus on sustainability, including freight transport as one of the most critical areas of logistics. Understanding the content and format of the Scientific Dissertation. Learning the basics of presentation techniques and preparing for a presentation at the end of the semester.</i>
Invoicing:	<i>Research work: Prepare a research paper in small groups and present the results at a house conference organized by the NJE. Compulsory participation in a specific research project, preparation of a 5-page submission, from which 30 points can be obtained. Presentation for the house conference was 15 points, and conference attendance was 5 points. A total of 50 points can be earned during the semester. The practical grade is awarded based on a 50% pass on the research paper and the conference component.</i>

As can be seen from the excerpt from the course description, which is a research-type topic, in addition to general and professional knowledge, particular emphasis is placed on developing soft skills, presentation, and lecturing. The conference's theme in 2023 was Industry 4.0, and in 2024, it will be sustainability specific to the disciplines. The following main topics were presented for the 2024 mentoring conference:

- Battery production and the environmental impact of battery factories;
- Greenwashing;
- Recycling of plastics;
- Use of alternative powertrains in transport;
- Use of modern technology for sustainability (3D printing, intelligent solutions);
- Sustainable design of physical and online networks.

The students chose the topics, so it is easy to see which are the main areas of interest for them regarding sustainability. The process of completing the subject is shown in Fig. 1.



Figure 1. Process for completing the subject for the student conference

According to the trainers, preparing for and attending the conference strongly develops soft skills, including communication, teamwork, independent task-solving, and problem-solving. An important aspect is that students can practice presentation techniques in a real-life situation in their first year. They will also acquire basic professional skills within the framework of the course. Student feedback also reflects the usefulness of the participation in the student conference.

4. Results

As the program is an entirely new initiative - not only at John von Neumann University but also in Hungarian higher education - it was essential to get regular feedback from the program participants, so we developed a 15-question questionnaire, and with the help of this questionnaire, we ask the students participating in the program at the end of each semester how they evaluated the mentoring work of their mentor teacher and mentor student, how much they felt the program supported them, and what suggestions for improvement they would like to make. The most important feedback for the program is the extent to which the student has achieved their goals for the semester, the extent to which the student's social and professional skills have been supported, and the extent to which the student has been helped to succeed in their studies. The sets of questions for the autumn and spring semesters are different and aligned with their original purpose, but the measurement of the core areas is the same in both questionnaires. In the spring semester questionnaire, there is also a particular emphasis on the Mentoring Conference and the assessment of the related mentoring subject.

Table 2 shows how students who took the mentoring course rated its supportive impact in the areas related to their studies in 2023 (N=85) and 2024 (N=250). Three of the measured points are directly related to the student's current or next semester's progress, while the professional development rating indicates a more far-reaching goal. Completing at least 30 credits a semester is essential for progression in the model curriculum and a condition for applying for certain student benefits and scholarships in the university system. The positive impact is strongly reflected in the student evaluation, with an overall positive response rate of over 80% in all areas.

Table 2. Mentoring program support impact based on student opinion in each area of academic progress

	30 credits to complete		to complete another subject		in my professional development		to obtain a study scholarship	
	2024	2023	2024	2023	2024	2023	2024	2023
absolutely not	8%	0%	6%	5%	3%	0%	13%	11%
rather not	4%	7%	10%	16%	7%	10%	8%	13%
usually yes	23%	16%	32%	29%	40%	20%	35%	34%
absolutely yes	65%	76%	52%	50%	50%	70%	50%	42%

Personal conversations between mentor teachers and students also confirm that they consider the mentoring program a precious academic and professional support and an excellent initiative. The subject not only has a direct impact on the development of a particular area but also on the positive perception of their self-image as a university student, as this semester, those who did not take a mentoring subject rated their semester performance at 3.80, while those who did take a subject rated it at 3.90. This difference in self-assessment will give them a long-term advantage in completing their university studies.

In 2024, nearly 40% of full-time students took the mentoring subject as an elective, of which 69% attended the Mentoring Conference. The positive impact of attending the conference is reflected in the subject completion and academic performance, as well as the overall perception of the mentoring program. Figure 2 shows the results of the responses to the general questions related to the program and shows that students who attended the conference have a 4-6% better overall opinion of the program than those who did not attend this event.

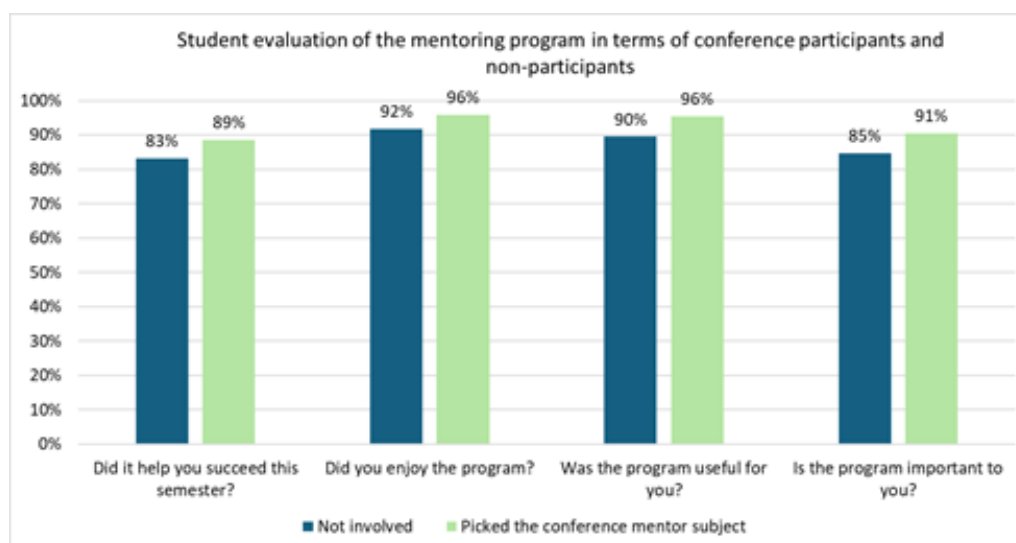


Figure 2. Student evaluation of the mentoring program by conference participants and non-participants

Attending the Mentor Conference was essential for completing the course, and the whole semester's learning and work culminated in the conference. However, the journey to the conference, the learning process, is significant. This is borne out by the responses of students who have taken a research or project course. Some of the questions measured changes in skills and abilities that are essential for successful university studies or an advantage in the labor market and necessary for later employment and advancement. Some of the questions relate to student's perceptions of the learning and performance of the subject. These are important partly for the further development of the program and partly for the students themselves, as the ability to self-reflect is essential for realistic self-evaluation and self-development. All the questions received a response rate of over 90% in the affirmative, which confirms the relevance of the conference and the preparatory course in higher education. In the previous academic year, a survey was conducted with students enrolled in a project course preparing for a BSc in Computer Engineering conference, where, in addition to the above, the direct and indirect professional impact of two compulsory subjects was measured [22].

Table 3. The impact of a conference preparation course

	absolutely true	mostly true	rather not true	absolutely not true
improved my problem solving skills	52%	45%	3%	0%
improved my presentation skills	48%	48%	0%	3%
learned how to present at a conference	45%	48%	3%	3%
learned how to prepare for a conference presentation	52%	45%	0%	3%
experienced what it is like to work in a team	55%	41%	3%	0%
the learning of the subject has been a success	52%	41%	7%	0%
I feel that it was useful for my further studies	48%	45%	7%	0%

The students' free-response responses confirm the previous ones when asked what they found most useful during the semester. Teamwork and the experience of working in a real-life situation were the most frequently cited benefits, although many also noted that this was the biggest challenge of the course. Another area mentioned by many was the creation of a professional project, with all its phases, including the division of tasks, coordination, and presentation. A substantial proportion of students had not been involved in any real project work during their secondary education, lasting several months. The third benefit mentioned by many people was the opportunity to present at a conference. The development of presentation skills was noted, with students highlighting two areas. On the one hand, developing presentation skills is more than technical skills; it is about the requirements and expectations of a professional or scientific presentation.

What should be put on a slide, and in what format? How should the content be placed and the whole presentation be structured? On the other hand, the development of presentation skills, as they have yet to be in a situation where they had to present months of activities and their results in front of more than 100 people. Understandably, this was the biggest challenge for them. By their admission, they have learned what makes a presentation both informative and exciting, what formal factors to pay attention to - appearance, posture, volume, eye contact - and how to present their work well. According to the students, the biggest takeaways from the conference, such as teamwork, working together on a project, and developing presentation skills, are experiences and developments that are essential and useful in the world of work.

5. SUMMARY

Developing soft skills and technical knowledge are essential for engineers in the 21st century. Communication and teamwork, problem-solving and critical thinking, leadership skills, intercultural competence, lifelong learning, and ethical responsibility contribute to engineers' success in the modern labor market. University education should adopt a holistic approach that focuses on transferring technical knowledge and supports students' personal and professional development. Higher education institutions use various methods to develop the soft skills of engineering students, preparing them for successful careers. One such method in Hungarian higher education has been the introduction of dual training. In this form of training, students spend at least half of their study time in a company, where they acquire a range of competencies such as cooperation, intercultural, presentation and negotiation skills, etc., in a real-life environment, in the context of real projects.

The part of the Mentoring Program introduced at the GAMF Faculty of the John von Neumann University concerning professional mentoring was presented, with particular emphasis on the Student Mentoring Conference and the related mentoring course. Several program-related evaluations support the relevance and importance of the mentoring program and the conference in the first semesters of university studies. These measurements have demonstrated the wide range of soft skills that the introduced course and the associated conference and lectures can develop in

engineering students, which are essential for both successful university studies and later success in the world of work.

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