Session Chair: Szilvia Homolya

16:20 – 16:40	György Hegedűs **Artificial Intelligence and CAD Systems in Mechanical Engineering Education**
16:40 – 17:00	Rita Nagyné Kondor, Erika Rozgonyi **Spatial Skills Development for Engineering Students**
17:00 – 17:20	György Budaházy, Anna Takács **MöGamT in Higher Mathematics Education**
17:20 – 17:40	Anna Muzsnay **Reducing Dropout Risk Through the Application of Retrieval Practice**
17:40 – 18:00	Balázs Kulcsár **The Loss and Development of Creativity in the Digital Age**

16:20 – 16:40	György Hegedűs – Associate Professor, University of Miskolc, Institute of Machine Tools and Mechatronics, Department of Machine Tools

Artificial Intelligence and CAD Systems in Mechanical Engineering Education

Artificial Intelligence and CAD systems are completely revolutionizing how mechanical engineering students learn, develop, and innovate. Automated algortihms support from AI-powered CAD tools improves the process, allowing students to create complex designs more accurately and in less time. This intelligent support helps AI-powered CAD tools simplify the design process and produce complex designs much more accurately for students.

Enabling generative design, real-time error detection, and automated optimization to encourage creativity and problem-solving skills helps students better internalize engineering concepts. Ultimately, this integration will allow students to learn more complex subjects, such as adaptive modeling and machine learning-based design analysis, by connecting theory and practical implementation.

The article presents the results experienced in recent years in the education of CAD systems supported by artificial intelligence, which is becoming increasingly powerful. It also outlooks on the opportunities expected in the future and the kind of paradigm shift that is needed for educators to accept and apply artificial intelligence.

16:40 – 17:00	**Rita Nagyné Kondor** – Associate Professor, University of Debrecen, Faculty of Engineering, Department of Basic Technical Studies **Erika Rozgonyi** – Associate Professor, University of Miskolc, Institute of Mathematics, Department of Descriptive Geometry

Spatial Skills Development for Engineering Students

According to previous studies there are correlations between spatial intelligence and performance of Science, Technology, Engineering and Mathematics (STEM). Visual–spatial ability can predict academic achievement and have a high importance in engineering education, computer graphics and architecture.
The goal of this report are to compare the freshman mechanical engineering students' spatial skills between University of Miskolc and University of Debrecen with regard to many spatial tests to understand whether the students of two universities have significant differences between their spatial abilities, and to investigate their spatial problem solving methods so that we can develop this skills.

17:00 – 17:20	**György Budaházy** – College associate professor, Budapest University of Economics and Business, Department of Applied Quantitative Methodology **Anna Takács** – College associate professor, Budapest University of Economics and Business, Department of Applied Quantitative Methodology

MöGamT in Higher Mathematics Education

Teachers in higher education institutions are using more and more didactic tools in their lessons to prepare students. Experiential learning is becoming more prominent in both the assessment and the teaching-learning process. The traditional lecture+exercise approach is difficult for our students to follow, which is why we need to use innovative tools and software in our mathematics education. Students who are accepted and enrolled in university are born into Generation Z, which is characterised by scattered attention and short attention spans. Our experience is that sometimes they easily "give up" on the first semester of the subjects Economic Mathematics, Mathematics Fundamentals 1, one of the triggers of which may be the development of incomplete skills or even a stagnation in the steps to abstraction. This is often coupled with the development of a fear of learning mathematics or a lack of success.

We have to pay attention to maintaining motivation in lectures, seminars and independent learning. Gamification is a possible way to make the practice more colourful and to increase motivation, in order to achieve a monotonous but instrumental mastery of the knowledge. Some elements of this will be presented in our presentation.

Möbius is a web-based test and exam system, but it can also be used to create digital learning materials. It is based on the Maple math software engine, which ensures that the equivalence of mathematical expressions is checked when entering solutions. Within the Möbius framework used at our university, we mainly use point accumulation as a complementary didactic method for continuous learning. Students are given a series of weekly exercises, which can be rewarded with points if they are solved at the right level. In Möbius, it is sufficient to enter the type exercises, but we have to pay attention to the parameter assignment, so that thousands of exercises of one type can be produced. In the lecture we use smartphone apps, which are also a tool for immediate feedback on the concepts learned. The tools for this are Kahoot and Mentimeter. Initially, when entering the Kahoot quizzes, we had to be careful to use linear writing, only asking questions on problems that matched this. This has been simplified now that the equation editing interface is available in the app.

In our presentation, we will detail our methodology and show the impact of the scorers on the marks achieved through statistical analysis.

17:20 – 17:40	**Anna Muzsnay** – PhD Student, University of Debrecen, Institute of Mathematics, Department of Algebra and Number Theory

Reducing Dropout Risk Through the Application of Retrieval Practice

The transition from high school to university mathematics and the low success rate in the first year of university mathematics is a problem worldwide. One of the most reported factors correlated with academic success is cognitive prerequisites, such as prior knowledge. Students entering university with higher entry scores and a stronger foundation in mathematics tend to perform better in exams and exhibit lower dropout rates. Conversely, those with weaker prior knowledge are at a substantially higher risk of failure and dropout. Aiming to reduce the dropout risk in first-year mathematics courses, we applied retrieval practice in their lessons. The positive effects of retrieval practice – the strategic use of retrieval to enhance memory – have been shown in several cases. Still, the extent to which it can help students learn higher mathematics at different input levels has been a question. In this research, we investigated first-year pre-service mathematics teachers' performance in two mathematics courses. Within the two courses, we divided the students into two groups. At the end of the practice sessions, the experimental group took a 5-10 minute test on the material learned on the given day. They had to solve two problems individually without external help. In the control group, the teacher presented the solutions to these problems. Students' input level was assessed at the beginning of their studies, and their topic-related problem-solving skills were measured twice during the semester and a few months after finishing the course. We utilized linear regression analysis to examine their test and post-test results across the two courses, considering their initial input levels. Our findings suggest that the applied retrieval practice can effectively reduce the dropout risk and help students with lower prior knowledge to catch up in learning higher mathematics.

17:40 – 18:00	**Balázs Kulcsár** – Associate Professor, University of Debrecen, Faculty of Engineering, Department of Basic Technical Studies

The Loss and Development of Creativity in the Digital Age

Twenty years of experience in higher education shows that digital technology, which is increasingly serving and helping people, is spoiling them to the limit. Ready-made solutions that are instantly available do not stimulate thinking and creativity in overcoming problems. This generational social phenomenon is further exacerbated by a liberal, protectionist, protectionist approach to parenting and education.
The result is a lack of empirical knowledge, a decrease in (engineering) creativity, a drastic narrowing of comfort zones.
This paper seeks ways to reverse these negative trends. The solutions include both classic forgotten techniques and the tools offered by digitalisation.
"The Hungarian engineer was in demand and appreciated worldwide in the second half of the 20th century because he was socialised in the scarcity economy, where necessity often called for great and simple solutions."