A learning community model: the Center for Innovative Education supporting academic didactics at Gdańsk University of Technology, Poland

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ABSTRACT: The current digital transformation requires academics to apply their pedagogical and technological skills to their teaching and professional development to address the newly emerging needs of the digital era. This study aims to analyse the operating model of the Center for Innovative Education (CIE) at Gdańsk University of Technology (Gdańsk Tech), Poland, as an incubator for professional development of academic staff at Gdańsk Tech, and outline the programmes carried out at the CIE. The focus is on systemic actions capable to elicit innovation at an organisational and personal level, including community building, higher education trend analyses, evidence-based professional training, designing new methods and tools for innovative teaching and appreciation programmes. The CIE's offer extends to well-being support and providing measures against professional burnout. The establishment of the CIE enabled academic teachers at Gdańsk Tech to improve their professional competence and build a strong peer-learning community.

INTRODUCTION

The world is changing, and with it, the needs of learners, their way of functioning, and access to tools and technology are evolving. The turn of the 20th and 21st centuries brought widespread access to the Internet, and thus to knowledge, which ceased to be the domain of lecturers alone. This is also the time of the flourishing of neuroscience and the expanding knowledge of how humans learn at the neuronal level. The pandemic has led humanity to make a developmental leap equivalent to a decade in the field of new technologies, especially remote communication. Finally, access to language models based on AI algorithms has begun to change teachers' thinking about ways to verify learning outcomes and provide support for learners.

According to the latest report from the World Economic Forum, the most important trends reshaping the higher education are learning from everywhere, replacing lectures with active learning, teaching skills that remain relevant in a changing world, and using formative assessment instead of high-stake examinations [1]. With the change occurring in the world, students' expectations in the field of academic didactics are also changing.

Centres for teaching and learning (CTLs) are important change agents on campus with strategies that are unique and impactful. The CTLs at universities worldwide are playing an increasingly important role in meeting the needs of the academic community and in achieving institutional strategic goals [2]. In response to these changes, the Rector of Gdańsk University of Technology (Gdańsk Tech), Poland, after one and a half years of preparations, established the Center for Innovative Education (CIE) at Gdańsk Tech in March 2021. Within just four years, the CIE has become an innovative laboratory that, based on solid scientific knowledge, analysis of global educational trends and technological achievements, supports academic teachers in designing an active learning environment [3] with a decreasing role of grades [4]. The mission of the CIE is not only to provide support in modern teaching methodology and digital tools, but also to build a community, support communication between teachers and care for their well-being. It is a laboratory for agile exploration of solutions that support the process of effective learning based on scientific knowledge [5].

The purpose and the mission of the CIE is to support teachers in reflective design of active learning environments, both in terms of teaching methodology and tool management, as well as in building a community of academic teachers and ways of communication and support in this process for students. The foundation of the design process for CIE activities is the analysis of research results on trends in higher education [1][6], especially for engineers, including those related to artificial intelligence and its use in the education of engineers, including architects [7].

A list of areas with programmes offered to academic teachers:

1. Professional training (certified workshops on methodology, neuroscience and use of new technology): in person, on-line, e-learning and ordered by faculty or department leaders.
2. Open on-line workshops for the whole teachers' community in Poland and abroad: *Didactic Fridays* and *Mondays at Gdańsk Tech*.
3. Mentoring (long-term) and consultations (short-form) for academic teachers.
4. Programmes for teachers: the *Celebration of Didactics* gala, the Didactic Innovations Competition, the Academic Teacher Appreciation Programme *edush#re*, the *Active Learning* programme, the *Growth Mindset* programme, the tutoring programme.
5. Didactic conferences for teachers: the National Conference on Higher-Ed *Ideatorium*, the National Conference e-Technologies in Engineering Education *eTEE*, and the National Conference *Gamification in Education*.
6. Gamification of academic subjects (designing long-term incentive systems for students).
7. Coaching and supervisions for academic teachers: for individuals and groups, mediation, working on motivation, conflict resolution support and prevention of occupational burnout.

The most important and influential programmes are on-line workshops *Didactic Fridays* and *Mondays at Gdańsk Tech*, *edush#re*, Didactic Innovations Competition, gamification in education programme, coaching and support for teacher well-being, *Active Learning* programme, *Growth Mindset* programme.

Didactic Fridays and *Mondays at Gdańsk Tech* are two nationwide open programmes to build a community of teachers in Poland, with free participation and meetings in the form of webinars. The weekly programme *Didactic Fridays* is addressed to academic staff at Polish universities and focusses on topics related to academic teaching and supporting lecturers in their professional work. The *Mondays at Gdańsk Tech* programme brings together a community of teachers of all educational stages from all over Poland on every last Monday of the month, where they can develop their workshop and share their experience during remote training. Several thousand teachers participate in both programmes, all trainings are recorded and available on the YouTube channel of the CIE.

Edush#re is a programme that is based on noticing, appreciating and sharing. It was created to recognise and honour the most charismatic lecturers and promote best practices in academic teaching. Each spring, candidates are nominated by students, who describe the actions of these exceptional teachers, then each of the nominees shares their approach to teaching. The winners are selected by the programme's chapter, and the results are announced at the *Celebration of Didactics* gala, where they receive statuettes and golden pins in the form of a hashtag from the Rector of Gdańsk Tech.

The Didactic Innovations Competition is a grant programme to support the most innovative teachers, the purpose of the competition is to develop and implement innovative teaching solutions that will enrich the achievements of the University and contribute to its further development, such as new elements related to the efficiency of the teaching process, flexible learning paths, experimental, interdisciplinary classes, trial implementations and pilot applications of new methods and forms of learning within the educational offer of Gdańsk Tech..

The CIE is the only university unit in Poland and the world to design long-term storyline motivation systems for academic subjects in the form of games on a university platform, and it offers the gamification in education programme. Gamification is a tool for fostering motivation by designing positive student experiences through mechanisms known from games. By engaging in a gamified process, students achieve higher results and learn with pleasure [8][9].

Tested and implemented projects on the gamification.pg.edu.pl platform are: *Beeophysics*, *Colossus from Algebron*, *Impact Project*, *Aztec Weather*; in addition, many teachers design and implement analogue gamified courses, such as *Magicians*, *My Studio*, *Political Career*, *Hungry Caterpillar*, and *Transportation Help Desk*. It gives students the opportunity to choose their own learning strategy through the selection of tools and forms of work and enables them to take responsibility for their own decisions. It also allows autonomous decision-making about when, how and at what level the student wants to learn, and it gives a sense of control over the situation and agency.

Coaching and support for teacher well-being is offered to academic teachers at Gdańsk Tech. As of 2022, each teacher can benefit from the offer of individual and group coaching, mediation, conflict resolution support, motivation and professional burnout prevention. Coaching and development training is provided by a professional development coach.

The *Active Learning* programme is a programme for designing and introducing changes to large, core academic subjects in the first years of engineering studies. Methodologists from the CIE work for several months with lecturers to change the way classes are taught to be modern and engaging for students, often using new technologies. Teams of academics teaching selected subjects from each department at Gdańsk Tech are invited to participate in the programme.

Growth Mindset is a programme to improve the competence of academic staff and doctoral students in supporting proactive attitudes and student learning skills, and to support the academic community in building a growth mindset [10]. The goal of the programme is to introduce a change in the beliefs of the staff about the importance of the impact of feedback, to enable them to gain the competence to support the formation of proactive attitudes and motivate them to learn, develop and take care of their well-being, and design classes supporting growth mindset in students.

Within the CIE, ten teams work on different topics to support academic teachers in improving the quality of education: methodological and instructional design (personal, e-learning and remote learning, consultations and methodological mentoring), designing games and gamification for academic subjects, creating graphics for courses, textbooks and other educational materials, organising educational events for teachers and didactic conferences, designing Web applications and Web tools for learning, implementing virtual and mixed reality, as well as AI into the educational process (CNE:LAB is a unique laboratory for experiments with new technology), audio, and video production (interactive videos, animations, podcasts), coaching for teachers and leaders, organising certified workshops on 20+ different topics or teachers and promoting activities externally (Figure 1).
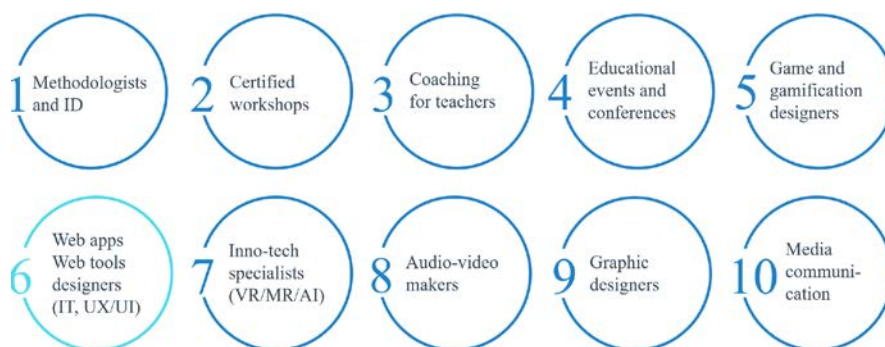

Figure 1: A model of CIE's structure: the teams being active within the CIE at Gdańsk Tech (light blue is for the team operating in the IT Service Center).

Moreover, the CIE analyses trends in higher education, reports on key competencies and results of the latest research in effective learning, conducts research on the effectiveness of implemented methods and builds a supportive peer-learning community of academic teachers. There is also an offer of classes for students on the neuroscientific foundations of learning and the programme designed to facilitate learning in physics.

METHODS

The CIE activities at Gdańsk Tech were launched in 2020. The research presented in this article was conducted for three academic years: 2020/2021, 2021/2022, 2022/2023, from the beginning of the new unit's operation. The results are from 1 June 2020 -30 September 2023.

Gdańsk Tech employs 1,378 academic staff (as of 30 September 2023) working at eight faculties and three teaching centres. The data analysed in this study refers to the group of people employed in full-time teaching and research and teaching positions. The people surveyed are employed in the following positions: doctoral student, assistant, lecturer, instructor, senior lecturer, university professor and professor.

RESULTS

In 2020-2023 (three academic years), 357 academics (26%) took part in professional training on methodology and the use of new technology in teaching, 165 in 2020/2021 only (12 %). On-line trainings were attended by 263 people (19%), while on-site trainings were attended by 174 people (13%). The workshops were attended by 53% of women and 47% of men. The total number of training completion certificates issued in 2020/2021 was 739, in 2021/2022 - 778, 2022/2023 - 1,055 (Figure 2).
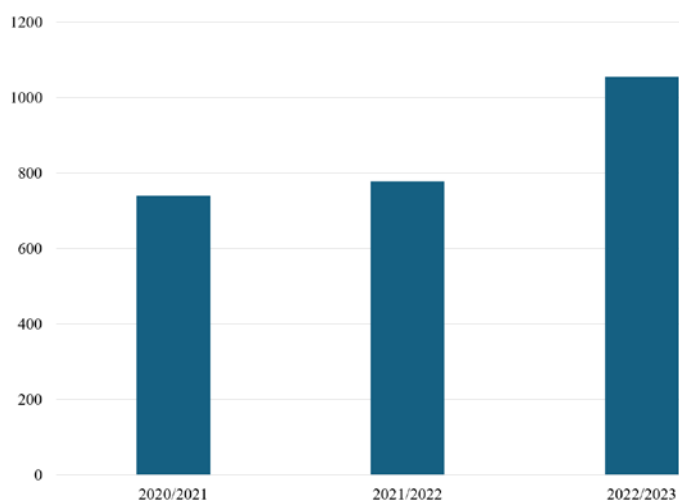

Figure 2: Number of training completion certificates by year.

Considering the type of position at the University, the workshops were attended by 176 adjuncts, 88 university professors, 43 assistants, 27 senior lecturers, 11 professors, five PhD students, five lecturers and two instructors (Figure 3).
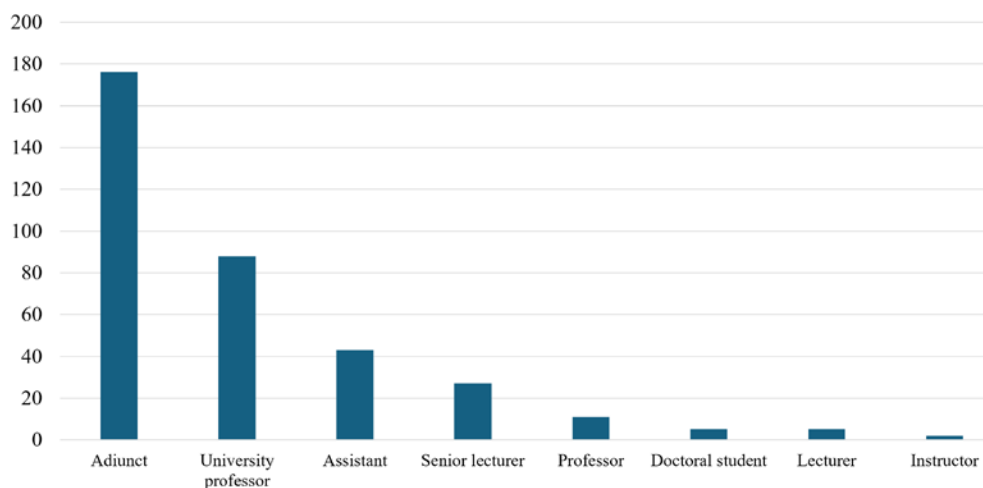

Figure 3: Training attendance - participants by position (2020-2023).

In the Didactic Innovations Competition from 2020-2023, 129 applications for funding were submitted, 35 were funded. In 2021: 11 funded (60 submitted), 2022: 13 funded (32 submitted), 2023: 11 funded (37 submitted) (Figure 4).
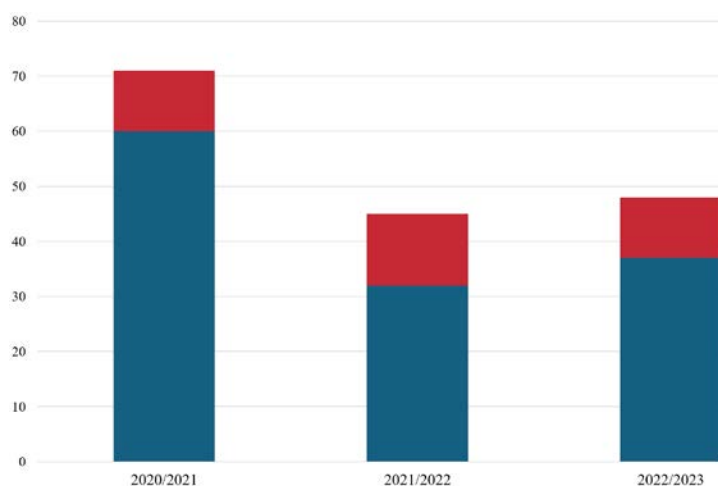

Figure 4: Number of submitted applications (blue) and funded applications (red) by years.

The CIE organised three teaching conferences in 2020-2023. A total of 120 teachers from Gdańsk Tech participated in them (active and passive). Twenty-nine participated in the National Conference e-Technologies in Engineering Education *eTEE* (September 2022), 33 participated in the National Conference *Gamification in Education* (May 2023) and 58 in the National Conference on Higher-Ed *Ideatorium* (June 2023) (Figure 5).
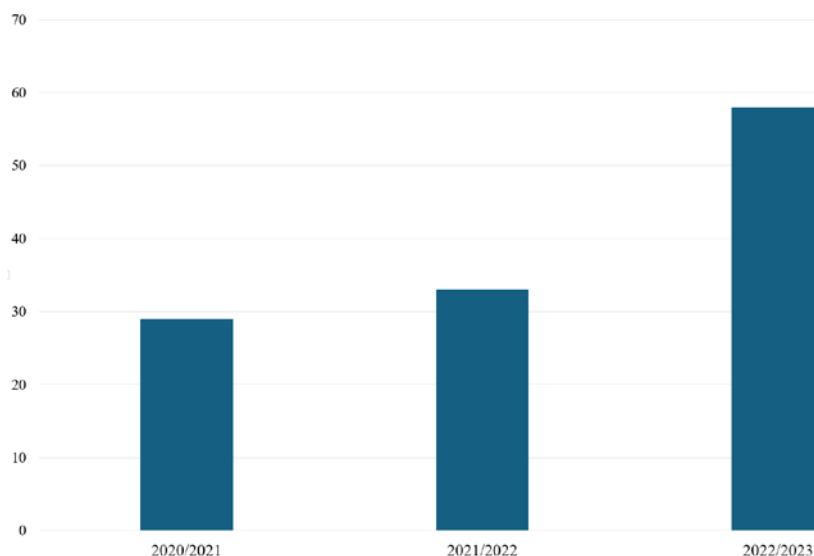

Figure 5: Number of academic teachers who participated in education conferences organised by the CIE, Gdańsk Tech.

Between 2020 and 2023, 18 gamification projects have been developed for academic subjects, and 12 more are currently in the design phase. A gamified subject is a whole-semester motivational system built to support students' motivation for learning, time management, teamwork and creativity. Four of these gamifications have been implemented in the form of computer games: *Colossus from Algebron* (linear algebra), *Beeophysics* (biophysics), *Weather in Aztec* (meteorology) and *Impact Project* (MBA studies). In 2020/2021 - three gamification games were designed and implemented, in 2021/2022 - six, in 2022/2023 - nine, in 2023/2024 - 13 in design (Figure 6).
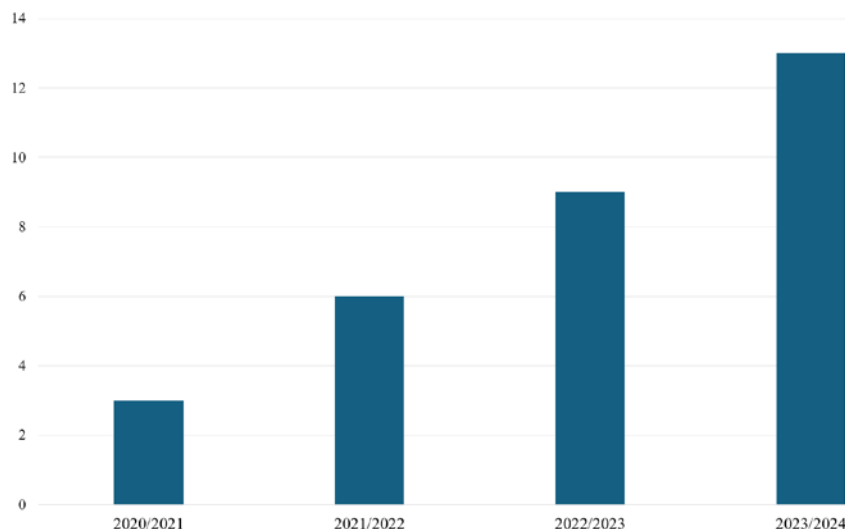

Figure 6: Number of gamification projects for academic subjects designed and implemented 2020-2024 at Gdańsk Tech.

CONCLUSIONS

The future of academic didactics in Poland is related to the functioning of units that systemically support university teachers. Lecturers need support not only in the areas of didactics, methodology, use of new technologies, including artificial intelligence, but also in appreciation and mental health. They need to be in a community that allows networking, inspiration, sharing of experience and best practices, establishing collaborations. Finally, they need a clear development programme, so they can plan their career paths and improve their competencies in their chosen areas.

The establishment of the CIE enabled academic teachers at Gdańsk Tech to improve their competence in teaching basing on methodology and neuroscience, design innovative teaching tools, use of new technologies in education, and build a strong peer-learning community. Already in the first year, 165 teachers (12%) voluntarily joined the training programme, this number increased to 357 (26%) after three years, which is a significant achievement and demonstrates the great need for teachers to develop their teaching career paths. Projects of 30 gamified academic subjects have been implemented in four years.

One-hundred-four teachers benefited from methodological consultations and mentoring support in developing new active learning methods and changing academic teaching. Ninety-four teachers applied for funding for didactic innovation projects, 35 were awarded grants and implemented their new ideas for innovative didactics. Most of the activities offered by the CIE show an upward trend in terms of the numbers of academics involved. A summary of the CIE's operations in numbers is shown in Figure 7.

Figure 7: Summary of CIE's operations and teachers' activity in numbers over the period 2020-2023.

Both men and women want to train, participation in training is distributed almost equally. The group most interested in developing their teaching skills is adjuncts (13% participating in training), followed by university professors (6%). There is a growing interest in implementing gamification into academic subjects by building long-term incentive systems for students (30 courses in four years).

The CIE is currently entering the next stage of development and opening itself up to international co-operation. A new on-line training programme in English has been launched in 2024. The best academics from all over Europe, including ETH Zurich, Switzerland, are being invited to conduct workshops. In 2023, Gdańsk Tech became a member of the ENHANCE alliance, a group of the top ten technical universities in Europe. The CIE carries out the task of *Building excellence in teaching* for all partner universities by organising, among other things, lectures and workshops on modern teaching methods for teachers, e-learning courses or methodological consultations. A summary of all CIE activities for 2020-2025 is shown in Figure 8.
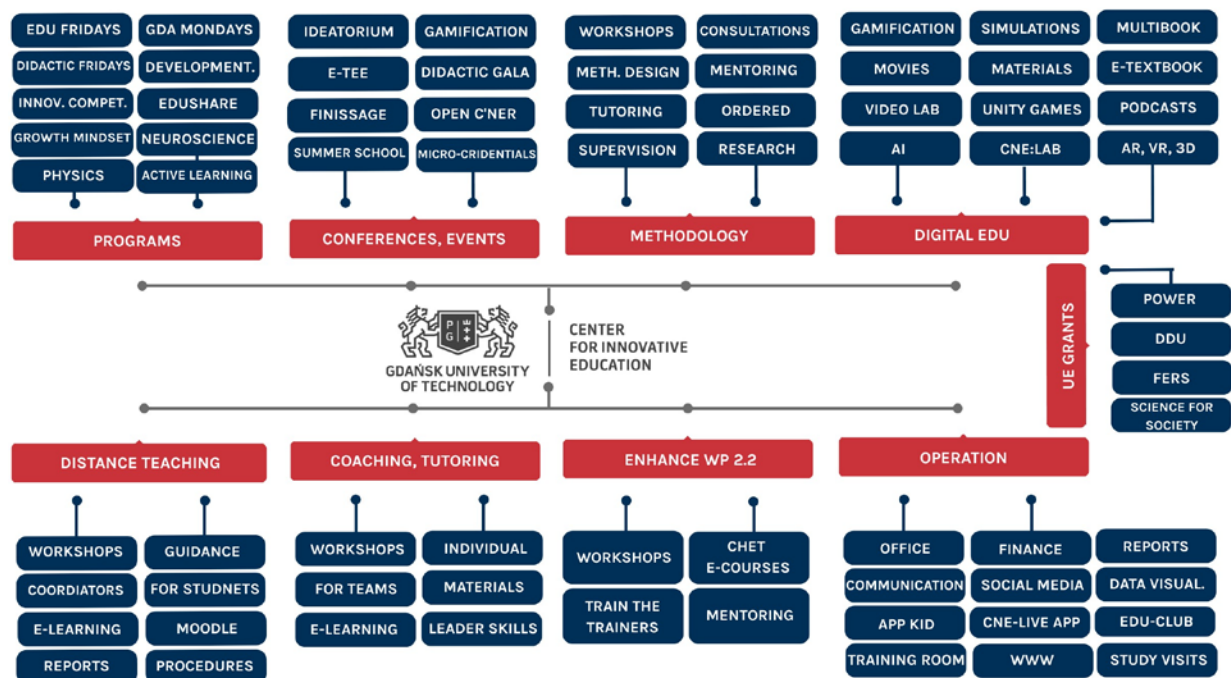

Figure 8: The map of activities realised by the Center for Innovative Education at Gdańsk Tech, strategy 2020-2025.

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BIOGRAPHIES

Joanna Mytnik, PhD, is a professor at Gdańsk University of Technology (Gdańsk Tech), Poland, director of the Center for Innovative Education at Gdańsk Tech since 2020, biologist, researcher, university lecturer/professor since 1999. She was awarded PhD in 2005, habilitation in 2012, and was appointed a university professor in 2013. Professor Mytnik is the author of 71 scientific publications, 12 research grants, nine university and ministerial awards and scholarships. She has been a designer of gamification in education since 2013, and is an expert in areas: neuroscience, original teaching methods and tools, gamification, active learning, new technologies, grading without grades, feedback, new technologies, AI in education, designing the scenarios of the future for education, Generation Z and Alpha.

Barbara Wikieł, PhD, is a professor at Gdańsk University of Technology (Gdańsk Tech), Poland. She graduated from the Faculty of Mathematics and Physics at Gdańsk Tech in 1992, and received her PhD from the Faculty of Environmental Engineering at Gdańsk Tech in 1998. She conducted her scientific and educational activity at the Institute of Soil and Rock Mechanics at the University of Karlsruhe, Germany (1995-1999). Professor Wikieł was a member of educational staff at the Faculty of Arts and Sciences at the ISIK University in Istanbul, Turkey (2000-2001). In the years 2006-2022, she was appointed Head of the Center of Mathematics at Gdańsk Tech. In 2022, she was elected the Vice-Rector for Student Affairs at Gdańsk Tech, the position she holds to date. She is being active in teaching mathematics using innovative methods of instruction.

Mariusz Kaczmarek, PhD, DSc, is presently a professor at Gdańsk University of Technology (Gdańsk Tech), Poland. He received his MS, PhD and DSc degrees in electronics and biomedical engineering from Gdańsk Tech, in 1995, 2003 and 2017, respectively. His research interests include development of non-invasive thermal monitoring methods in medical diagnostics, life support technology/assisted living technology, image processing and artificial intelligence techniques in medical applications. He is a member of the Polish Society of Biomedical Engineering and the Polish Society of Medical Physics. Since 2018, he has been a member of the Editorial Board of the Quantitative InfraRed Thermography Journal. Since 2022, Professor Kaczmarek has been the Vice-Rector for Education at Gdańsk Tech.