



MatRIC Centre for Research,
Innovation and Coordination
of Mathematics Teaching

MatRIC - Centre for Research, Innovation and Coordination of Mathematics Teaching

Final report 2024





Introduction

It was with great pride that MatRIC could celebrate its 10-year anniversary on 24 and 25 January 2024 in Kristiansand. We are particularly proud to be able to show all the activity the MatRIC team has done during 10 years as a centre for excellence in education (SFU). We have come a long way towards our vision that students should enjoy transformed and improved learning experiences of mathematics in higher education. But we still have a way to go. There will always be changes in our society and thus excellent education will also always be changing. There is a need to constantly look for ways to improve teaching and learning and within MatRIC we have created a community with this attitude.

During the period as a centre for excellence in education, MatRIC has consolidated its position as a national and international leading centre in mathematics in higher education. MatRIC has taken important leadership roles in international conferences and networks. At the same time, we have made innovations in mathematics education, and we have delivered outstanding research. Nationally, MatRIC has also created a meeting point for mathematicians and mathematics didacticians who are interested in higher education mathematics teaching and learning.

Through MatRIC's annual conference, and other workshops and events, we have invited world-leading experts to the Norwegian environment. We have gathered mathematicians and mathematics educators who share MatRIC's vision. MatRIC has also taken the

lead in organising national conferences, workshops, and working groups.

MatRIC has put the student at the centre and further developed student partnerships. The MatRIC Drop-in centres in Campus Kristiansand and Campus Grimstad have become living learning arenas, developed together with the students. We are very proud of the activity taking place in these centres, and we are happy that MatRIC Drop-in will continue after the period as a centre for excellence in education is over.

MatRIC would not have been a success without everyone who has contributed to this project. Thanks to everyone in the MatRIC team at the University of Agder (UiA). Thanks to the management board and advisory board for the guidance you have provided. Thanks to all colleagues at Norwegian and international institutions who have participated and contributed to MatRIC events and shared your expertise. Many people share MatRIC's vision, and we would not have been able to get this far without your cooperation. Thanks to UiA, which has been an excellent host institution for MatRIC. Finally, we would like to thank all the students who have helped MatRIC to transform and improve the learning experiences of mathematics.

This report summarises the major achievements in MatRIC during the 10 years as an SFU.

Thomas Gjesteland
Centre Leader

Lillian Egelandssaa
Project Manager



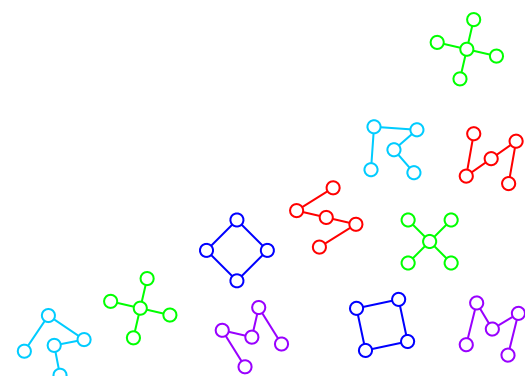
Mission

Mathematics is important for all students in STEM (Science, technology, engineering, and mathematics). Mathematics is also crucial for students in economics programs, teacher education, and other fields of study. For many students, mathematics is the gatekeeper for further education. Students who struggle with mathematics can be found at all universities, a phenomenon often referred to as the “math problem”. However, there are also students who perform well in mathematics. MatRIC’s focus has been on all students who have mathematics in their higher education studies. Both the ones who perform well and those who struggle. MatRIC’s mission is to transform and improve mathematics teaching and learning for students at the University of Agder, students in Norway, and students internationally. All of MatRIC’s actions have been aimed at fulfilling the vision:

Students enjoying transformed and improved learning experiences of mathematics in higher education.

MatRIC realises its vision through three focus areas:

- ① Transforming students’ learning experiences
- ② Transforming mathematics teaching
- ③ Research and development-based mathematics education





**CENTRE FOR
EXCELLENCE
IN EDUCATION**

Read Simon Goodchild's reflection on mathematics teaching in this chapter:

"Students Enjoying Transformed and Improved Learning Experiences of Mathematics in Higher Education"

"Students Enjoying Transformed and Improved Learning Experiences of Mathematics in Higher Education" Goodchild, S. (2023). In: Stewart, S. (eds) Mathematicians' Reflections on Teaching. Advances in Mathematics Education. Springer, Cham.



Simon Goodchild
Professor, MatRIC
Director 2013 - 2020



Transforming students' learning experiences

The intention is for students to enjoy mathematics and be motivated to engage with the challenges of mathematics. They should feel supported throughout their studies without lowering the cognitive demand to the extent that it interferes with their learning. The intention is for all students to be fully engaged as active learners and partners in the learning, teaching and assessment process.

MatRIC Drop-in

MatRIC Drop-in is a mathematics help resource for students at the University of Agder. Established on Campus Grimstad and Campus Kristiansand in 2015, these centres have since developed, with students as partners, into living learning arenas. The students

“

I came with academic questions, but I stayed because of the good social environment”

Quote from a student

interviewed by the newspaper Fædrelandsvennen [Read more](#). Praise the good working environment at MatRIC Drop-in. They claim that the academic and social environment is making a difference in their studies. MatRIC's Drop-in is staffed for 20-30 hours every week on both campuses.

We clearly see that the drop-in centre is both an action towards a better learning experience in mathematics and also serves as a key point of dissemination to students at UiA. We are pleased to see that the Writing Lounge - a drop-in for academic writing - has been established at UiA. We also see growing interest from other Norwegian institutions that want to establish similar drop-in centres for students. The University of Bergen plans to start a drop-in for mathematics. Also, CreaTeME, the new SFU at UiA, will open a student-driven drop-in for popular music students.

The MatRIC Drop-in is now a well-established learning centre that will continue to operate after the SFU period is over.

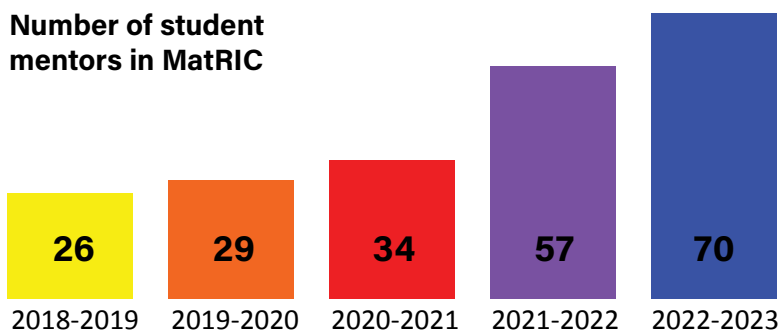


More information:





Number of student mentors in MatRIC



Learning assistants

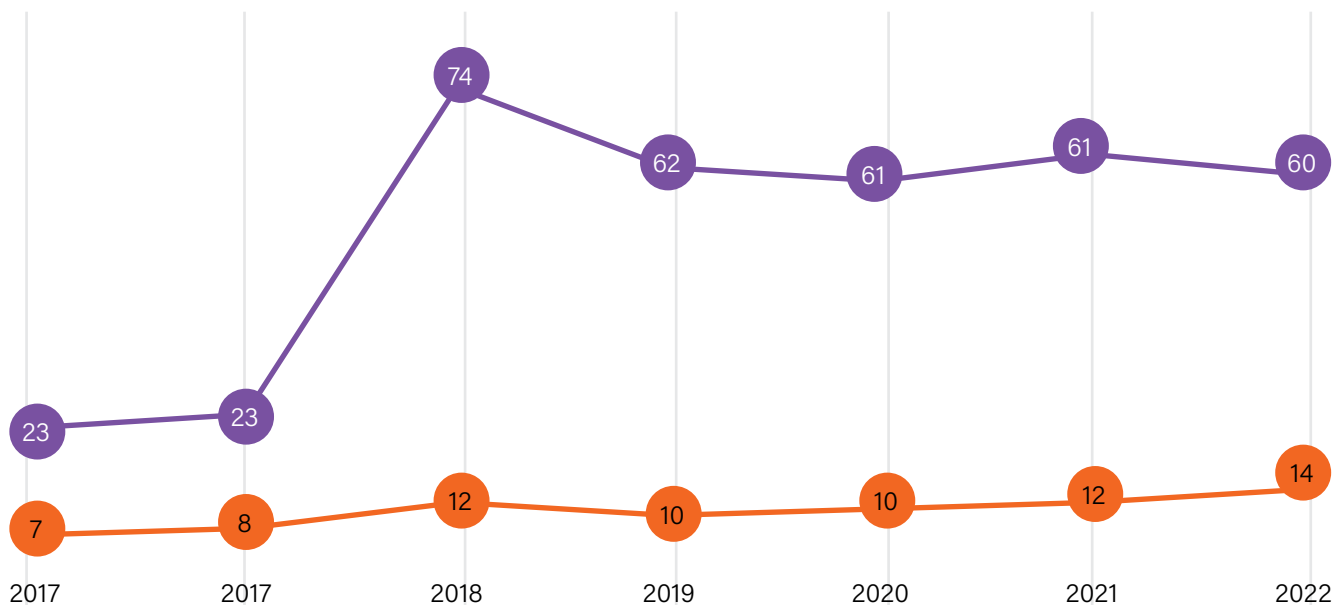
In 2017, MatRIC piloted a two-day residential training camp for student teaching assistants and mentors in August, before the start of the academic year. We aimed to prepare the mentors for their role and let them get to know each other well. The main topics covered included communication, the meaning of learning, learning styles, active learning, characteristics of a conducive learning environment, and how

to develop such an environment. The camp also included training on mathematics didactics. Since 2021, MatRIC invited the mentoring scheme at the Faculty of Engineering and Science FYSE (First Year Study Environment) to join the camp. FYSE and MatRIC share the vision of involving students as partners in education and collaborate to educate the learning assistants. [Read the full story.](#)



Student mentor camps 2017-2023

At Skottevik



Oransje viser deltagere av ansatte og lilla viser antall studentmentorer som deltok på studentmentor camp.

Human connection competence

Student mentors with training in interpersonal skills for security and a better learning environment contribute to increased quality of education at UiA. Students learn together with others in groups or one-on-one. The student mentoring schemes at UiA expand training with an emphasis on the psychosocial, how to create security for learning to prevent dropout, provide increased learning joy, and as a result - also better results. Established in 2019, it is overseen by Eva Dønnestad.

Creating unity among mathematics students

Mathematics students from various study programmes are making use of campus for social and academic gatherings. Throughout the spring and autumn semesters from 2021 and 2022, the MatRIC mentor and other teaching assistants organised over 20 events, including social gatherings and exam preparation workshops, activity evenings, and academic events. Over 300 students attended. In the autumn and spring of 2022 and 2023, the mentors organised over 23 events with more than 450 participants. The exam preparation workshops have been very popular with the most participants.



Fighting failure rates

Popular preliminary course

For several years there has been a high failure rate in mathematics in the business administration programme. MatRIC's PhD Research Fellow, Ida Maria Landgärds-Tarvoll, has developed and is running a popular preliminary course to ensure that more students pass. 150-170 students attend every lesson. [Read more.](#)

Many first-year economics students at the University of Agder are not mathematically prepared for their studies in undergraduate economics as the economics education involves a high degree of mathematics. As a result, the mathematics for economists course had a consistently high failure rate of 40-60% for several years. Investigation of the failure rate revealed that many students did not previously have the opportunity to study the basic mathematics needed for success in their school mathematics course. To address this issue,

MatRIC's PhD Research Fellow, Ida Maria Landgärds-Tarvoll, designed and implemented a pre-course intervention consisting of a diagnostic test and a bridging course. Many first-year economics students (80-85%) have taken advantage of the zero-credit bridging course every year, and the failure rate lowered to 10-12% each year after implementation. In addition, students report high satisfaction with the course, the course structure and the opportunity to test themselves and be informed about their current and expected knowledge. The students also report that the bridging course served as an important social opportunity for them to connect with their peers and establish their identity as economics students.

This model has become widely known in Norway and has been adopted at other economics departments, as well as inspired similar solutions in teacher education programmes at the University of Stavanger.

More about research in these articles:

Landgärds, I. (2021) The Impact of a Mathematics Bridging Intervention on the Inclusivity of a University Economics Programme. *Nordic Journal of STEM Education*, 5.

Landgärds-Tarvoll, I. (In review) Bridging the gap: curriculum development addressing the transition into mathematics in economics education. *INDRUM* 2024

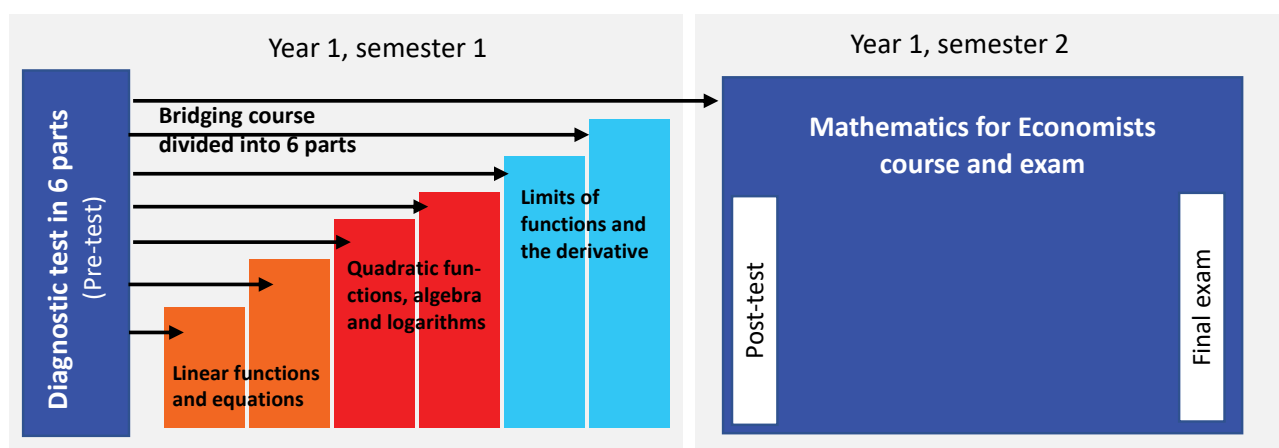


Figure 2: The pre-course intervention. This figure is an elaboration on Figure 1 in Landgärds (2021).

Change in assessment form for engineering students

MatRIC has led the work to change the assessment in mathematics for engineering students. Instead of a large written examination at the end of the year, we have introduced four smaller digital exams spread throughout the semester. There is also an assignment to hand in at the end of the course.

The students can retake each of the tests several times within a two-week period. With the

new exam format, the students are inspired to work steadily throughout the course. Many have changed their study routine, and we can see that the student environment has improved. We see that they help each other more. Following each of the smaller tests, students often gather in groups to discuss solutions and how they can do improve their performance.

We have also seen an increased use of the MatRIC Drop-in service

after implementing the new assessment. [Read more.](#)

The development of the new assessment format is based on several years of research and innovation. Throughout its period as an SFU, MatRIC has built a strong international network in digital assessment, drawing on experience and piloting various approaches.

The changes in assessment in mathematics for engineering students are based on this research article:

Zakariya, Yusuf F.; Midttun, Øystein; Nyberg, Svein Olav Glesaaen; Gjesteland, Thomas (2022). Reforming the Teaching and Learning of Foundational Mathematics Courses: An Investigation into the Status Quo of Teaching, Feedback Delivery, and Assessment in a First-Year Calculus Course. Mathematics. ISSN: 2227-7390. 10 (13).



MatRIC TV

In 2015, Universities Norway (UHR) awarded MatRIC a grant to produce high-quality videos of important topics in mathematics. They are targeted at first-year students. A production group led, at MatRIC's invitation, by Professor Tom Lindstrøm (UiO) included mathematics teachers from OsloMET, USN, NTNU and UiO.

In 2022, MatRIC enlisted the expertise of Professor Jo Røislien, known from various NRK series about mathematics. He was invited to UiA to produce 16 video films focusing on statistics. Scripts were created from his resource group of other well-known mathematics teachers, and filming took place with the participation of students from both UiA campuses.



Podcast

Niclas Larson from MatRIC produces the podcast "Spøkelser etter avdøde størrelser". The podcast features informal discussions about mathematics.



Transforming mathematics teaching

MatRIC has built a community of practice in mathematics education. MatRIC has facilitated the exchange of experience, expertise, and best practices between mathematics teachers at Norwegian higher education institutions and connected them with international experts in teaching and learning mathematics. The specific objectives in the development of practice include incorporating research and development within regular teaching and comprehensively involving students as partners in the educational process.

Innovation networks

Computer-Aided Assessments

Since the beginning of the SFU period, MatRIC has developed a Norwegian network for Computer-Aided Assessments (CAA). How to utilise CAA to enhance teaching and learning of mathematics has been one of MatRIC's goals. MatRIC has also established a strong international network with the world-leading experts in the use of CAA. This network was led by Morten Brekke until he became vice-rector for education in 2019. Since then, Niclas Larson has led this network. The network has organised several workshops and conferences. The aim has been to bring together researchers and practitioners with an interest in e-assessment for mathematics and the sciences.

Simulation and visualisation

MatRIC has initiated a network focused on mathematical visualisations and simulations to support teaching and learning. The network coordinator has been Per Henrik Hogstad. The network has developed numerous resources during MatRIC's 10 years. MatRIC has developed simulations in mathematics and other STEM subjects through the SimReal project. SimReal is linked to Naturfagsenteret and the pre-course for engineering textbooks in physics and mathematics at Cappelen Damm. simreal.no



PLATINUM

The European project PLATINUM (Partnerships for Learning And Teaching in University Mathematics) engaged a consortium of 8 universities from 7 countries (University of Agder, Norway (coordinator); University of Amsterdam, Netherlands; Masaryk University, Czech Republic; Brno University of Technology, Czech Republic; Loughborough University, England; Leibniz University Hannover, Germany; Complutense University of Madrid, Spain; Borys Grinchenko Kyiv University, Ukraine) to develop inquiry-based mathematics education (IBME) approaches in the teaching of mathematics. Mathematical demands in university courses represent a considerable hurdle for many students and for quite a few this is known to lead to dropping out or changing studies. But even among students who successfully pass mathematics exams, there are many who do not achieve the intended teaching goals.

The consortium partners were well aware that they were facing a major challenge as university teaching conditions, particularly in the first university years, are not conducive to inquiry-based practices: courses gathering large numbers of students with diverse backgrounds and professional projects, crowded curricula to be covered in a short period of time, etc., not to mention the lack of pedagogical and didactic preparation and experience of such practices for the majority of university mathematics lecturers. For this purpose, the partners made their way to create a community that exchanges ideas

about possibilities and limits of the implementation and realisation of the different design approaches of IBME. They engaged into the collective production of resources in the form of inquiry-based tasks and teaching units which address many mathematical domains—complex numbers, functions of one or more variables, differential equations and dynamical systems, linear algebra, geometry, statistics and numerical analysis—teaching aimed at future mathematicians and mathematics teachers, but also very often service mathematics courses, a sector where IBME and mathematical modelling are closely linked.

The consortium members demonstrated that it is possible to engage in inquiry-based practices without revolutionising one's teaching, that many ordinary tasks, if reformulated, can engage students in more conceptual work and bring them into the spirit of inquiry. Another interesting and original dimension of this project is the attention paid to students with special needs and the difficulties they may encounter in the different phases of an inquiry process. The forms that these difficulties may take according to the students' profiles are specified and many practical suggestions are provided. The PLATINUM project was promoted at different national and international events and became one of the easily recognisable educational products associated with MatRIC and UiA. Yuriy Rogovchenko was the project coordinator and Barbara Jaworski was the academic leader. platinum.uia.no

The PLATINUM research is published in the book:

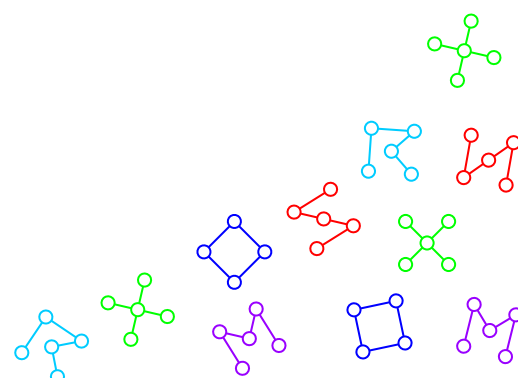
"Inquiry in University Mathematics Teaching and Learning- The PLATINUM Project"

Editors :

Ines M. Gomez-Chacon,
Reinhard Hochmuth,

Barbara Jaworski, Josef
Rebenda,

Johanna Ruge, Stephanie
Thomas





Capacity Building in Mathematics and Statistics Learning Support in Norway and the Czech Republic (MSLS Net)

The project “Capacity Building in Mathematics and Statistics Learning Support in Norway and the Czech Republic (MSLS Net)” has improved cooperation in learning and teaching mathematics and statistics between higher education institutions in the Czech Republic and Norway. The project has shared experience in MSLS

provision outside the classroom, promoted the idea of MSLS in higher education, and supported the development of national MSLS networks. The project participants included the Brno University of Technology, Masaryk University, the Arctic University of Norway, the University of Agder, and Tomas Bata University in Zlín. The project

has developed training materials for students and mentors of mathematics and statistics support centres, and a handbook on good practices in mathematics and statistics support centres. Svitlana Rogovchenko from the MatRIC team led this project.

Mathematics teaching induction course

MatRIC has developed a 150-hour course for mathematics teachers. The goal has been to improve the quality of teaching of higher education mathematics teachers, to stimulate interest and inquiry in teaching mathematics, to raise the status of higher education mathematics teaching, to contribute to community building as new participants join

the enterprise of higher education mathematics teaching. In this course MatRIC has engaged world leading lecturers. Three cohorts have completed the course during the SFU period.

- **First cohort:** 2015-2017. Seven mathematics teachers completed the course.

- **Second cohort:** 2017-2018. 11 mathematics teachers completed the course.
- **Third cohort:** 2019-2020. 19 participants completed the course. 10 Norwegian and 9 German. This course was organised in collaboration with the German Centre for Excellence in Mathematics Education- khdm.



The International Network on Educational Research on Mathematics in Economics Education (INERME)

The INERME network was established after the calculus conference in Bergen in June 2023. INERME seeks to foster the exchange of ideas concerning the teaching and learning of mathematics in economics education and to encourage research in this field.

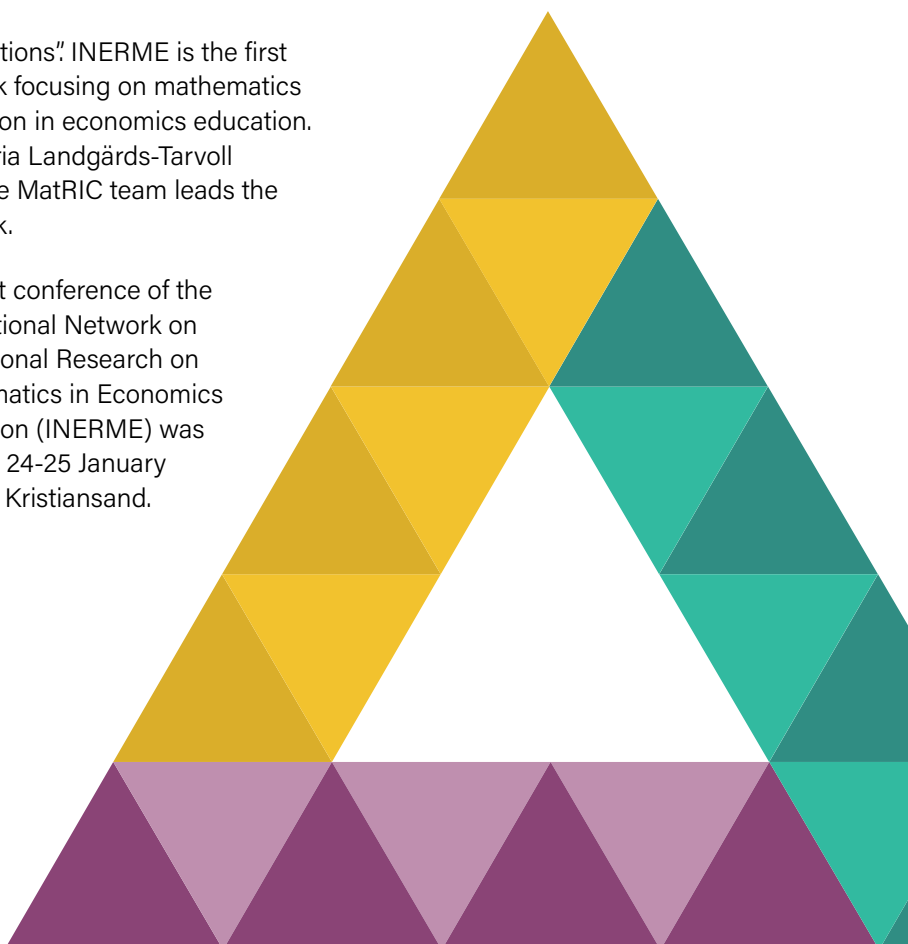
In particular, this collaborative endeavour aims to facilitate the writing of articles for the forthcoming Special Issue of "Teaching Mathematics and its

Applications". INERME is the first network focusing on mathematics education in economics education. Ida Maria Landgärds-Tarvoll from the MatRIC team leads the network.

The first conference of the International Network on Educational Research on Mathematics in Economics Education (INERME) was held on 24-25 January 2024 in Kristiansand.

INERME

International Network for Educational
Research on Mathematics in Economics



Course for Mathematics Teacher Educators 2021-2023



Quote former participant:

"The scheme of the entire study is very well planned. Everything from lecturers, curriculum activities and selected meeting places in Norway create good conditions for the conscious implementation of appropriate mathematics didactics that make a difference. We are given the opportunity to influence attitudes towards mathematics in school through both good and bad examples."

The Course for Mathematics Teacher Educators brings together teacher educators with strong mathematical backgrounds, teacher educators who aim to qualify as associate professors, and teacher educators interested in improving their teaching and supervision skills. The programme offers the opportunity to develop competence in teaching mathematics in teacher education.

14 participants have completed the full 30 ECTS course.

Ideas from this course have been utilised by teachers at UiA yielding excellent results! Henrik Aadland Kjelsrud and André Martiny used didactical methods for this course. Their pre- service teacher students are the best in Norway on the national exam. [Read more.](#)

The course is developed by MatRIC and the Norwegian Centre for Mathematics Education at NTNU. The organisers are Linda

Opheim and Simon Goodchild from MatRIC. UiA organises this course together with Raymond Bjuland, Janne Fauskanger and Reidar Mosvold from UiS, and Kjersti Wæge, Director, Norwegian Centre for Mathematics Education at NTNU.



Course for Mathematics Teacher Educators, Linda Opheim

The idea behind this course was presented in this conference paper:

"Designing professional development for mathematics teacher educators", Linda G Opheim, Raymond Bjuland, Janne Fauskanger, Simon Goodchild, Reidar Mosvold and Kjersti Wæge. Twelfth Congress of the European Society for Research in Mathematics Education (CERME12), Feb 2022, Bozen-Bolzano, Italy

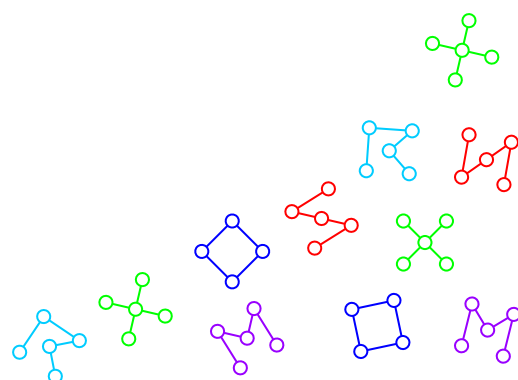


Merit award scheme

MatRIC has been a significant contributor to the merit award scheme at UiA. In 2018, MatRIC's Morten Brekke became the first Excellent Teaching Practitioner

at UiA. The merit scheme is important for the quality culture in higher education and to improve the quality of teaching and increase the value of education for

students. The merit award scheme committee was led by Simon Goodchild in 2021 and Thomas Gjesteland in 2022. [Read more](#)



Research and development-based mathematics education

MatRIC's goals are to transform students' learning experiences in mathematics and to transform mathematics teaching. For MatRIC it is highly important that the innovations and actions are motivated by research. MatRIC has a world-leading research group in university mathematics education that publishes and disseminates

results in recognised journals and conferences.

PhD fellows, postdocs and researchers

MatRIC has maintained a strong research focus. Innovations and changes have been followed up with research. Over the course

of its 10 years as an SFU, six PhD fellows have completed their doctoral degrees. There are currently four PhD fellows who are still working towards their degrees. MatRIC has also employed three postdocs and two full-time researchers.



PhD research fellows



Helge Fredriksen

Doctoral defence 2020.

Fredriksen, H. (2020). An exploration of teaching and learning activities in mathematics flipped classrooms: A case study in an engineering program (Doctoral thesis). University of Agder, Kristiansand.



Yusuf Feyisara Zakariya

Doctoral defence 2021

Zakariya, Y. F. (2021). Undergraduate students' performance in mathematics: Individual and combined effects of approaches to learning, self-efficacy, and prior mathematics knowledge [PhD thesis]. University of Agder, Kristiansand.



Amrit Bahadur Poudel

Doctoral defence 2021

Poudel, A. B. (2021). An exploration of how social science students utilise an opportunity to learn about simulation-based research methods: A design-based study [PhD thesis]. University of Agder, Kristiansand.



Shaista Kanwal

Doctoral defence 2020

Kanwal, S. (2020). Dynamics of undergraduate engineering students' learning activities in mathematics in an online and in a blended environment (Doctoral thesis). University of Agder, Kristiansand.



Eivind Rudjord Hillesund

Doctoral defence 2021

Hillesund, E. R. (2020). The resource decisions and documents of undergraduate engineering students in mathematics courses (Doctoral thesis). University of Agder, Kristiansand.



Ioannis Liakos

Doctoral defence 2023

Liakos, I. (2023) "The development of students' mathematical competencies: The case of biology students" (Doctoral thesis). University of Agder, Kristiansand.

PhD research fellows in progress

“

The networks and the opportunity to connect with other researchers have been important aspects of MatRIC”

Quote Siri Ovedal-Hakestad



Siri Ovedal-Hakestad

We know that digital assessment is here to stay, and therefore it is crucial to understand how this digital transformation affects students' mathematical learning. Her research aims to understand how students perceive digital assessment. Specifically, the study investigates in-service teachers' involvement in learner-generated example tasks through a computer-aided assessment system, and what specific procedures the in-service teachers utilise and how they perceive this way of working.



Mahboubah Nedaei

She investigates the approaches of engineering students to mathematical learning when they learn higher mathematics with different learning goals. Moreover, biosensing technology will be utilised to measure indicators of students' cognitive activity while learning mathematics and facilitate inferences about their learning approaches.



Ida Landgärds -Tarvoll

Her research explores the intersection of mathematics and economics education, focusing on the challenges students face transitioning from school to university-level mathematics. She is particularly interested in addressing the diverse mathematical backgrounds of the student group and the application of mathematical concepts in economics courses.



Ninni Marie Hogstad

Ninni researches first-year engineering students' learning processes when they use a digital tool called Sim2Bil to solve tasks in groups. In these tasks, they use calculus to make an animation of two cars behave in certain ways, thus working at the intersection of mathematics and physics. By studying their discourse, we get to understand how they communicate mathematics to each other, what challenges they face and how they navigate between different disciplinary discourses.



Postdoc



Olov Viirman

Postdoctoral Fellow from
2015 to 2017



Yusuf Feyisara Zakariya

Postdoctoral Fellow from
2021 to 2023



Farzad Radmehr

Postdoctoral Fellow from
2019-2020

Agder Academy of Sciences and
Letters prize for young researchers
for 2021 is awarded to Dr Yusuf
Feyisara Zakariya. [Read more](#)



Examples of some research and innovation projects in MatRIC

Mathematical modelling:

MatRIC, together with another Centre of Excellence in Education, bioCEED and colleagues in the Department of Mathematics at the University of Bergen, and also with the Centre for Organelle Research at University of Stavanger produced mathematical modelling resources that support the mathematical education of students in biology, medicine, and life sciences. The aim is to equip biology students with mathematical skills and knowledge that align with their background and meet professional needs. Another goal is to stimulate these students' interest in obtaining better and, hopefully, more advanced knowledge of mathematics.

Teaching during covid

MatRIC initiated a national survey of online mathematics teaching and learning in Norwegian higher education institutions to explore lecturers' and students' experiences and enable the sharing of solutions to the challenges encountered due to the pandemic. The study shows that it appears that some mathematics teachers were unaware of various challenges that students faced during the transition from physical to digital teaching.

Read more about this research in this research article:

Radmehr, Farzad; Goodchild, Simon (2022). Switching to Fully Online Teaching and Learning of Mathematics: The Case of Norwegian Mathematics Lecturers and University Students During the Covid-19 Pandemic. International Journal of Research in Undergraduate Mathematics Education. ISSN: 2198-9745. 8s 581 - 611. [doi:10.1007/s40753-021-00162-9](https://doi.org/10.1007/s40753-021-00162-9).

Read more about this research in:

Liakos, Y. (2023). The development of students' mathematical competencies: The case of biology students [Doctoral dissertation]. University of Agder.

Viirman, Olov Lui; Goodchild, Simon; Rogovchenko, Yuriy (2016). Using mathematical modelling activities to motivate biology students to learn mathematics. Proceedings of the 40th Conference of the International Group for the Psychology of Mathematics Education. ISBN: 9781365463389. PME. Vol. 1. s 262 - 262.



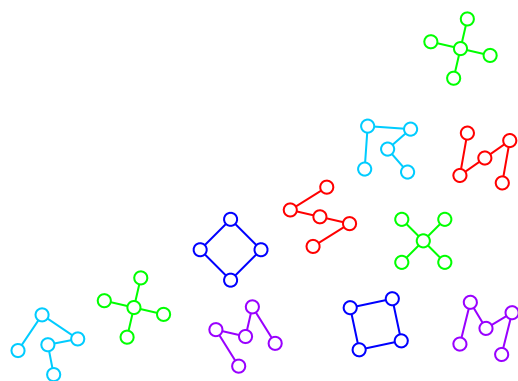


MatRIC and the Norwegian Mathematics Council Survey of Teaching Approaches

MatRIC, in collaboration with the Norwegian Mathematics Council (NMR), has led a national survey on teaching approaches in mathematics. The team consisted of Kirsten Bjørkestøl, Simon Goodchild, and Hans Kristian Nilsen from the MatRIC team, as well as Inger Christin Borge from the University of Oslo, and Odd Helge Mjøllem Tonheim from Volda University College.

Ramme: Read more about this research in:

Goodchild, Simon; Bjørkestøl, Kirsten; Borge, Inger Christin; Nilsen, Hans Kristian; Tonheim, Odd Helge Mjøllem (2021). Educating to inspire active learning approaches in mathematics in Norwegian universities. [Nordic Journal of STEM Education](#). ISSN: 2535-4574. 5 (1). doi:[10.5324/njsteme.v5i1.3972](#).



MatRIC

Forskning- og utviklingsstipend



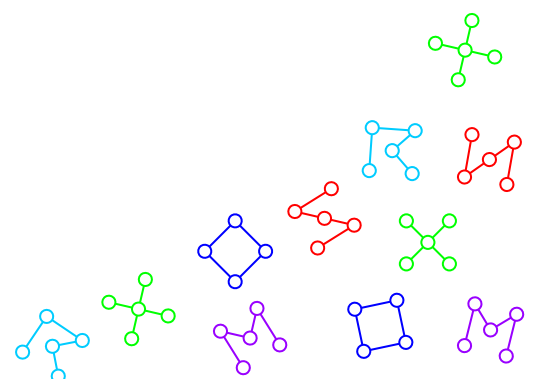
MatRIC grants

MatRIC has provided small research grants to promote innovation and collaboration. Over the 10-year period, MatRIC has awarded 24 small projects of NOK 50K to teachers at UiA and other Norwegian institutions. In addition, two larger grants of NOK 250K have been awarded. One to a research group led by Western Norway University of Applied Sciences, which is investigating Norwegian pre-service teachers' understandings of how digital technologies could be used in mathematics teaching and learning. The other grant was awarded to a group at the

Norwegian University of Life Sciences, which explored student-active, inquiry-based teaching approaches that enhance students' mathematical reasoning.

Sci-Code is an interactive learning platform that will help students learn programming. The platform was developed by master's students at UiA. This project received a MatRIC grant in 2016. After finishing the MatRIC grant, the students received NOK 1 million from the STUD-ENT scheme through the Norwegian Research Council to further develop the platform.

**Read more about
MatRIC grants**



STUDENT ENTREPRENEURS

BACKGROUND

Students as entrepreneurs: initiating, creating, producing and presenting
Student as Project Manager

MatRIC is one of eight Norwegian Centres for Excellence in [Higher] Education. MatRIC's aspiration is for students in all Norwegian institutions of higher education to have the opportunity to enjoy 'world class' mathematics education.

MatRIC has student advisory groups, one on each of the university's two campuses. Both groups meet regularly with MatRIC's Project Manager and have representation on MatRIC's Management Board.

Kim Roger Anderssen is leader of one of the advisory groups, Kim is a final year master student following an engineering programme.

Kim was approached by SCI-CODE a small team of students [following engineering courses] with an idea for an on-line resource for learning programming: "Will MatRIC sponsor their work?"



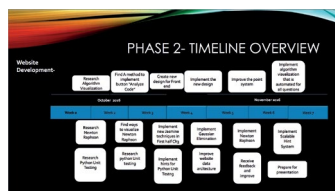
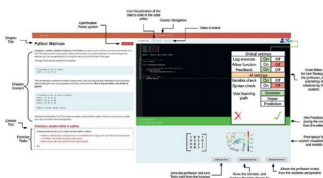
Ragnar Bjørnson, Magnus Lysfjord, Tarek Rahou and Simen Fossnes.

MatRIC agreed to finance an initial pilot phase (about 250 hours work) to develop a prototype, but only if Kim agreed to be the MatRIC Manager of the project. Further, the project team, SCI-CODE was required to submit their proposal to Kim who was to argue for the required support from MatRIC Centre leaders. Kim was also required to monitor the project, evaluate the prototype and 'sign off' phase one only when he was satisfied it was completed according to the proposal.

PROCESS – PRODUCTION

The SCI-CODE team worked on their prototype over three summer months, probably spending far more than the 250 hours for which they were paid.

The team was asked to present their prototype at a 'Mathematics Teachers Lunch', and later at the MatRIC national conference.



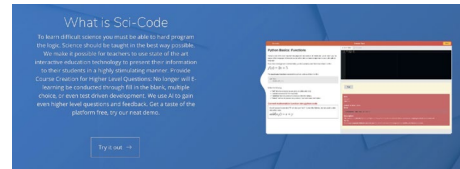
One Mathematics teacher, at the lunch saw in the product the answer to a challenge she faced with a numerical methods course – students are required to do some programming, but there is insufficient time to develop their programming skills adequately.

The SCI-CODE team requested funding for phase 2 to refine the product, with a similar number of hours. Kim continued to be MatRIC's manager of the project. One further request was made, that the SCI-CODE team should discuss with the numerical methods mathematics teacher and ensure the resource met the needs of the students in her course.

Phase 2 has been completed, the resource is about to be used by the teacher.

Phase 3 is agreed.

THE PRODUCT



SCI-CODE

The Mathematics teacher's appraisal

"The platform has the possibility to create different courses, create exercises, write neat equations (in LaTeX code) and to test the code the students write, as well as giving hints. There is also a code visualizer built into it, with a graphical representation of how the algorithms work. In addition, there are some statistics where the teacher checks the progress of the students.

I think the platform definitely will lower the threshold to start programming for many students. We should make sure to spread the word in any way we can. I think they've created something that's not available at any other Norwegian university."

– Prof. Margrethe Wold

CONSEQUENCES

Sci Code has been presented:

- MatRIC's Annual Conference: Addressing the challenges faced by teachers and learners of university level mathematics
- ADILA (Agder Digital Learning Arena): D-TEL 2016 Symposium on Advances in Digital Technologies for University Teaching & Learning
- STATNETT FOU Conference: UBC konferansesenter, Ullevål

Recommendations

- "I see great value of this tool to visualize the internal dynamics of complex AI algorithms in class, as well as a platform for the students to practice building AI algorithms in their assignments" - Prof. Granmo. Leader of the Centre for Artificial Intelligence Research (CAIR) and CEO Anzyz Technologies As
- The evolution of the pedagogical methods is without a doubt the principal stake of the future of education. Digital devices, like Sci-Code, will take a very important position in the class of the 21st century" - Dr. Nacera MERAHI (Neurobiology, EPF) - expert and speaker in new ways of teachings processes, coach in learning optimization.

WHAT HAS MATRIC DONE FOR SCI-CODE

- **Catalyst** - "The partnership we have formed with MatRIC has been absolutely essential to our inception, continual efforts and to the progress of our project."
- **Motivation** - "Without MatRIC, it would not have been possible to create and persist with the creation of the website over this previous year and a half."
- **Incentive** - "They have provided us with an incentive to commit to and to conduct cutting edge research and development in the field of education."



Read more
here



Dissemination of knowledge and practices

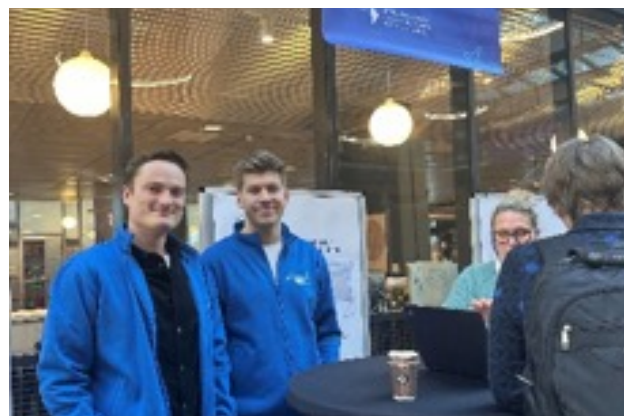
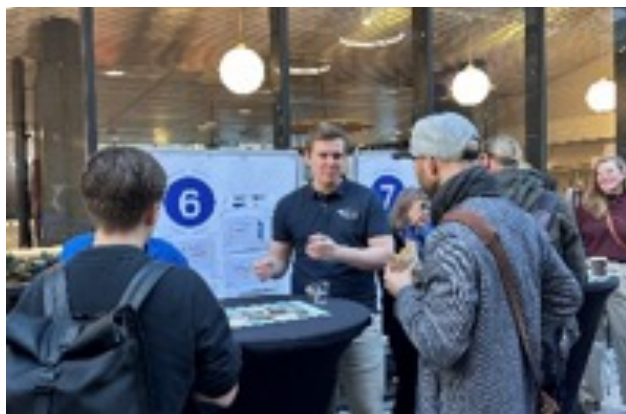
MatRIC's annual conferences

The annual MatRIC conference provides a crucial platform for dissemination. International experts are invited to showcase groundbreaking work on the teaching and learning of mathematics in higher education to the Norwegian community. The conference also serves as an important networking opportunity. Over the SFU period, MatRIC has organised nine annual conferences.



Annual Conference 2014-2023

Year	Place	Total participants
2014	Trondheim	98
2015	Trondheim	98
2016	Gardermoen	75
2017	Gardermoen	77
2018	Gardermoen	105
2019	Bergen	84
2020	Planned in Bergen	Cancelled because of covid
2022	Kristiansand	80
2024	Kristiansand	80



Open Lecture

MatRIC's 'Open Lecture' primarily targets incoming students and upper secondary schools. The main objective of these lectures has been to raise awareness about MatRIC among students, to ensure they will recognise that MatRIC offers drop-in support centres, efforts to develop student teaching assistants, and actions promoting students as partners in teaching and learning. Further, the lectures aim to spark interest and encourage active engagement in mathematics for its own sake.

18.08.2014

Jo Røislien

11.09.2015

Håvard Tjora

01.09.2016

Roger Antonsen

31.08.2017

Vibeke Fængsrud

Since 2018-2023

MatRIC has collaborated with TEKNA on Realfagdagen for upper secondary students. These open lectures were given by Magnus Dehli Vigeland.

27.04.2023

**Jo Røislien,
Grimstad**

28.04.2023

**Jo Røislien,
Kristiansand**

25.01.2024

Peder Kjøs



ÅPENT FOR ALLE

ROGER ANTONSEN

**TORSDAG
1. SEPTEMBER**

**FOREDRAG
Magiske mønstre**

**Kristiansand: B1 007 kl. 10.15-11.15
Grimstad: Bluebox kl. 13.00-14.00**

 **MatRIC** Centre for Research,
Innovation and Coordination
of Mathematics Teaching

 **UNIVERSITETET I AGDER**



International conferences organised by MatRIC:

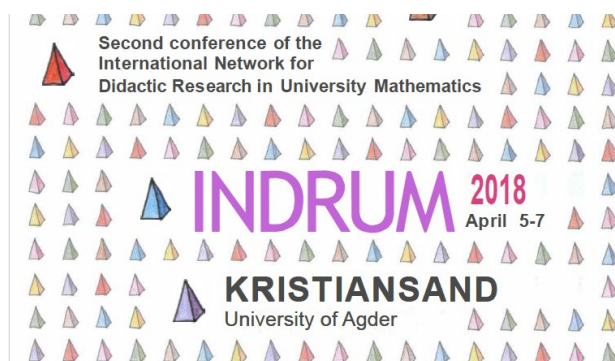
MatRIC has supported and organised important national and international conferences

INDRUM 2018



5-7 April 2018 in Kristiansand

INDRUM 2018, the second conference of the International Network for Didactic Research in University Mathematics. The themes to be addressed at INDRUM 2018 will build on those addressed at INDRUM 2016 and will cover a range of issues concerning teacher and student practices and the teaching and learning of specific mathematical topics at undergraduate and post-graduate level as well as across disciplines.



Calculus in upper secondary and beginning university mathematics



6-9 August 2019 in Kristiansand

Calculus spans high school and beginning university mathematics and is, in many ways, the gateway to higher mathematics. This conference is designed as an opportunity for mathematics educators (curricula developers, researchers, practitioners and others) to take stock of where we are, to discuss important aspects of teaching and learning calculus and to leave the conference with plans for collaborative academic projects and/or papers on calculus related themes.

The Programme Committee consisted of John Monaghan, Elena Nardi and Tommy Dreyfus



MNT-konferansen (STEM conference) 2021



15-16 March 2021 in Kristiansand

UiA and MatRIC together with Universities Norway (UHR) and Nasjonalt senter for Realfagsrekruttering organised MNT-konferansen (the STEM teaching conference). The conference is a biennial scientific conference on teaching and learning. The aim of the STEM conference is to contribute to the development of a culture for a scientific approach to teaching and learning within the STEM field – a scholarly approach to

planning, carrying out, evaluating, assessing, and reviewing teaching and learning. In other words, fostering a Scholarship of Teaching and Learning (SoTL) culture. The STEM conference is connected to the Nordic Journal of STEM education (NJSTEME). NJSTEME is a scholarly peer-reviewed, open-access journal publishing in the broad field of educational development in Science, Technology, Engineering, and Mathematics (STEM) Higher Education.



The 20th SEFI Special Interest Group in Mathematics - SIG in Mathematics Seminar on Mathematics in Engineering Education

17-18 June 2021 in Kristiansand, Norway

The SEFI SIG in Mathematics Working Group aims to provide a forum for the exchange of views and ideas amongst those interested in

engineering mathematics and promote a fuller understanding of the role of mathematics in the engineering curriculum and its relevance to industrial needs.



The Learning and Teaching of Calculus Across Disciplines

5-9 June 2023 in Bergen, Norway

How do biologists, chemists, economists, engineers and physicists understand and use calculus concepts in their disciplines? And what does that imply for the teaching and learning calculus in their disciplines? This conference explored these complex questions

by bringing specialists from these disciplines together with mathematics educators.

The Programme Committee consisted of Tommy Dreyfus, Alejandro S. González-Martín, John Monaghan, Elena Nardi and Pat Thompson



Workshops and seminars

MatRIC has organised many events and workshops over the 10-year period. Here are some highlights:

- 2016, 2017 and 2018: MatRIC organised the national Workshop for Teacher Education in Kristiansand
- Mathematical Modelling colloquium in Kristiansand, 9-11 August 2016. This symposium brought together speakers from Mexico, USA, Portugal, UK, the Netherlands and Norway. The symposium has initiated a teaching-learning research project that involves a mathematics teacher at UiA Grimstad Campus and a mathematics education researcher at UiA Kristiansand Campus – the developmental research initiative, cross-campus collaboration and inter-departmental activity are highly desirable outcomes from this event.
- E-Assessment in Mathematical Sciences (EAMS), Newcastle University, 28-30 August 2018. Read more.
- Workshop on Scientific Programming 5-6 November 2018 at Gardermoen, together with CCSE - Centre for Computing in Science Education at UiO.
- MatRIC-khdm International Workshop on Support for Students in Mathematics in the First Year of University Studies. Workshop, 13-14 June 2019, Leibniz University Hannover. The workshop identified both international and country-specific measures in mathematics education research. It was built on existing collaborations between MatRIC, khdm, and universities in Ireland and the UK, bringing together experts from Germany, Norway, Ireland, and the UK to deepen these partnerships.
- “Webinar om hjemmeeksamen i matematikk”, 27 January 2021. This webinar brought together more than 100 Norwegian mathematics teachers to share their experience on take-home exams in mathematics during the pandemic.
- 1st Northern e-Assessment Meeting, 31 May – 2 June 2023 in Trondheim together with NTNU. The meeting brought together educators, researchers and practitioners with an interest in e-assessment for mathematics, science and programming. The focus of the meeting was on types of questions and assessment of students’ replies in a way that facilitates learning. The content will consist of a mix of up-to-date research, best practice-presentations, and experience exchange.





Leadership roles nationally and internationally

Members of the MatRIC team have taken on various leadership roles nationally and internationally:

- Ida Landgärds-Tarvall is the leader of the International Network on Educational Research on Mathematics in Economics Education (INERME).
- Linda Gurvin Opheim participated in the Norwegian Directorate for Education and Training's working group that advised on changes to mathematics examinations in upper secondary schools 2022-2023.
- Linda Gurvin Opheim works as a consultant for the Norwegian Directorate for Education and Training examination boards.
- Thomas Gjesteland served as the editor-in-chief of the Nordic Journal of STEM education (NJSTEME), 2021-2023.
- Thomas Gjesteland served as a board member of the Norwegian Mathematical Council, 2021-2023.
- Thomas Gjesteland is a member of the "Holmboeprisen"-committee, 2021-2024.
- Thomas Gjesteland led the mathematics working group responsible for the National Curriculum Regulations for Engineering Education for Universities Norway.
- Morten Brekke is a member of the STACK International Advisory Board.
- Morten Brekke is a member of the steering committee for the European Society for Engineering Education (SEFI) The Mathematics Special Interest Group (MSIG).
- Morten Brekke serves on the editor board for the journal "Teaching Mathematics and its applications".
- Simon Goodchild and Frode Rønning organised a symposium in NORMA, 2017.
- Simon Goodchild and Barbara Jaworski served as editors for NOMAD Volume 22, No 4, December 2017. A thematic issue on research into the teaching and learning of mathematics in higher education.

MatRIC team

Employees MatRIC 2014-2023	Role
Simon Goodchild	Centre Leader
Thomas Gjesteland	Centre Leader
Line E Malde	Project Manager
Lillian Egelandssaa	Project Manager
Morten Brekke	Board Chair, engineer teaching, assessment and video
Anne Berit Fuglestad	Drop-in and research
Ida Maria Landgärds-Tarvoll	Economic mathematics
Niclas Larson	Assessment and teacher education
Opheim, Linda Gurvin	Teacher education
Per Henrik Hogstad	Engineer teaching and simulation
Svitlana Rogovchenko	Research and engineer teacher
Yuriy Rogovchenko	Research and mathematics teacher
Beate Lien	Economic mathematics
Kristoffer Knutsen	Economic mathematics
Claire Vaugelade Berg	Teacher education
Inger Johanne Håland Knutson	Drop-in, Board Member
Pauline Vos	Researcher and teacher education
Rolf Nossun	Economic mathematics
Sverre Lunøe-Nielsen	Assessment and engineer teaching
Øystein Midttun	Assessment and engineer teaching
Andre Martiny	Teacher education
Cornelia Brodahl	Teacher education
Hansen, Leif Ove	Engineer teaching
Heidi Oftedahl	Engineer teaching
Henrik Njølstad	Teacher education
Henrik Aadland Kjeldsrud	Teacher education
Ho, Alex	Engineer teaching
Håkon Raustøl	Teacher education
Kristina Markussen Raen	Teacher education
Kristoffer Heggelund Knutsen	Economic mathematics

Margrethe Wold	Engineer teaching
Martin Carlsen	Teacher education
Olav G. Dovland	Economic mathematics
Per Sigurd Hundeland	Teacher education
Svein Olav Nyberg	Engineer teaching
Wiik, Anders	Teacher education
Hans Kristian Nilsen	Research
Said Hadjerrouit	Research
Kirsten Bjørkestøl	Research
Olov Lui Viirman	Postdoc
Amrit Bahadur Poudel	PhD Research Fellow
Eivind Hillesund	PhD Research Fellow
Floridona Tetaj	PhD Research Fellow
Helge Fredriksen	PhD Research Fellow
Ioannis Liakos	PhD Research Fellow
Mahboube Nedaei	PhD Research Fellow
Ninni M. Hogstad	PhD Research Fellow
Ovedal-Hakestad, Siri	PhD Research Fellow
Shaista Kanwal	PhD Research Fellow
Yusuf Feyisara Zakariya	PhD Research Fellow and Postdoc
Frank Reichert	Dean
Michael Rygård Hansen	Dean
Ingvald Erfjord	Head of department
Jorunn Mona Skofteland Gislefoss	Faculty Director
Mange Aasheim Knudsen	Faculty Director
Paul Ragnar Svennevig	Head of Department
Damare Stenbakk	Web pages, writing
Dyrli, Bendik Egenes	STACK technical computer coordinator
Dønnestad, Eva	Coursing of student mentors
Elisabeth Rasmussen	Conferences, others
Jiang Ling	Contracts, others
Sissel Eikeland	Web pages, writing
Susanne Hulda Tollerød	Web pages
Svege, Elna	Head of Department and Drop-in
Saara Maria Ojanen	Design and layout
Trine Engeland	Student Contact

MatRIC board



Morten Brekke
Chairman /Vice
Rector for Education



Thomas Gjesteland
Director MatRIC



Hallvard Arntzen Foss
Student Representative,
Campus Kristiansand



Michael Rygaard Hansen
Dean Faculty of Engi-
neering and Science



**Johan Olav
G.Bjørnstad**
Director, UiA PULS



Nithlen Ratnarajah
Student Representative,
Campus Grimstad



Paul Ragnar Svennevig
Head of Department of
Engineering and Science



Linda G. Opheim
Board member
Department of
Mathematical Science



Margrethe Naalsund
External Member
(NMBU)



Ingvald Erfjord
Head of Department of
Mathematical Science



Hilde Inntjore
Dean Teacher
Education Unit



Frode Rønning
External Member
(NTNU)



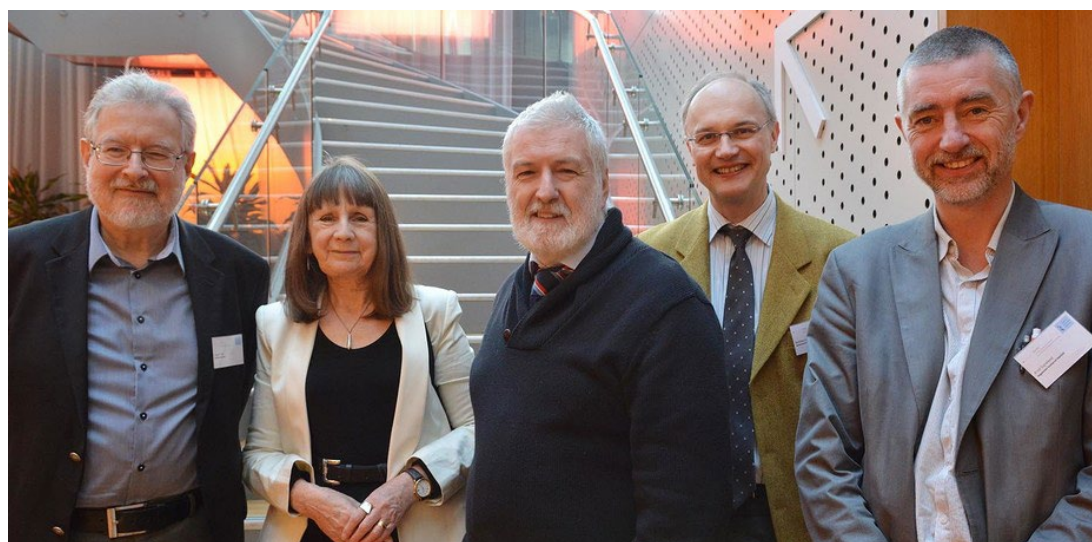
Inger Johanne H. Knutsen
Board member
Department of
Mathematical Science



Lillian Egelsandsaa
Project Manager
MatRIC

Advisory board

Professor Duncan Lawson
Professor Barbara Jaworski
Professor Burkhardt Alpers
Professor Arvid Siqveland
Professor Mogens A. Niss
Professor Brynjulf Owren
Professor Kjærsti Wæge





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