MatRIC Centre for Research, Innovation and Coordination of Mathematics Teaching

Centre of Excellence in Education

Presentation to panel appointed by NOKUT to conduct MatRIC's mid-term evaluation

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22 May, 2017

UNIVERSITY OF AGDER

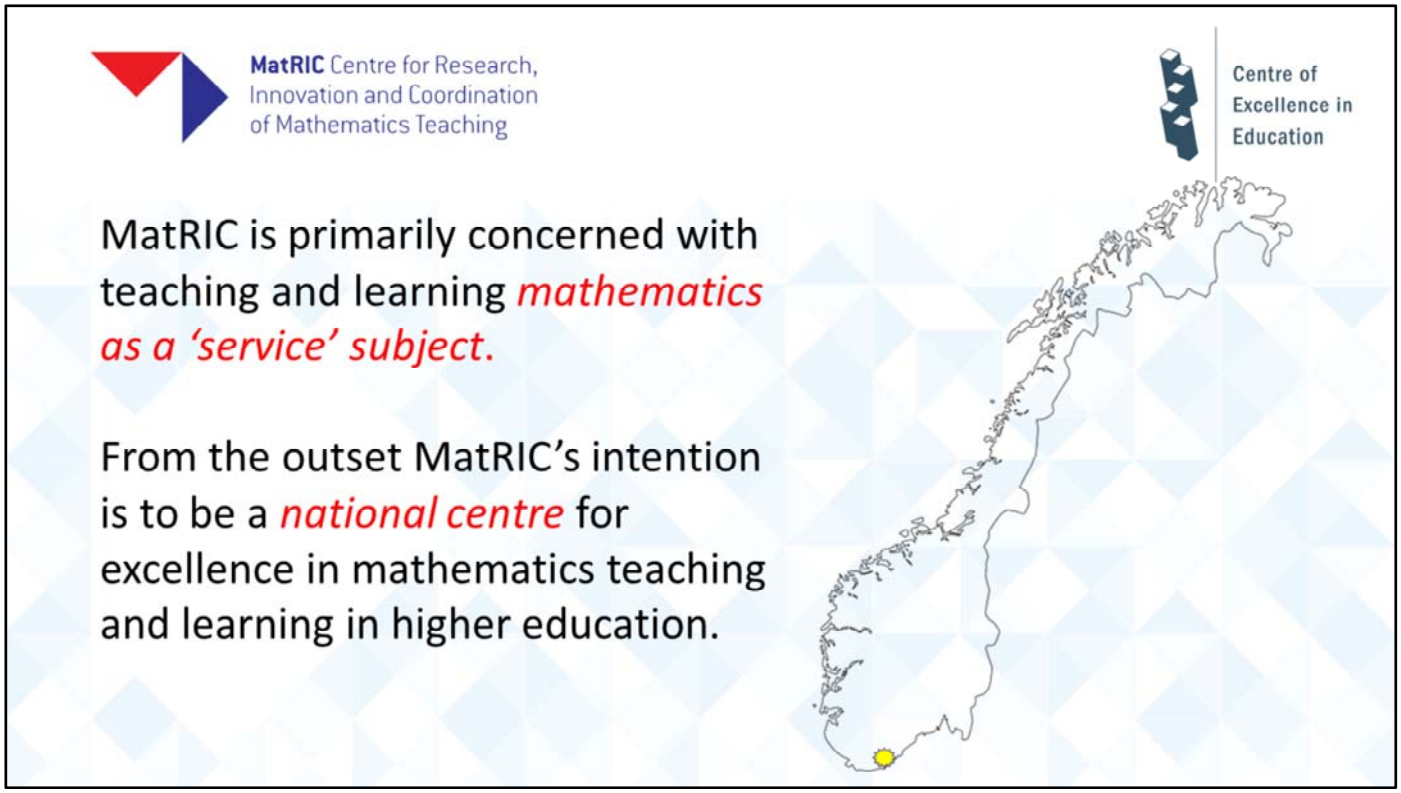
In collaboration with:

NTNU – Trondheim Norwegian University of Science and Technology

Matematikksenteret

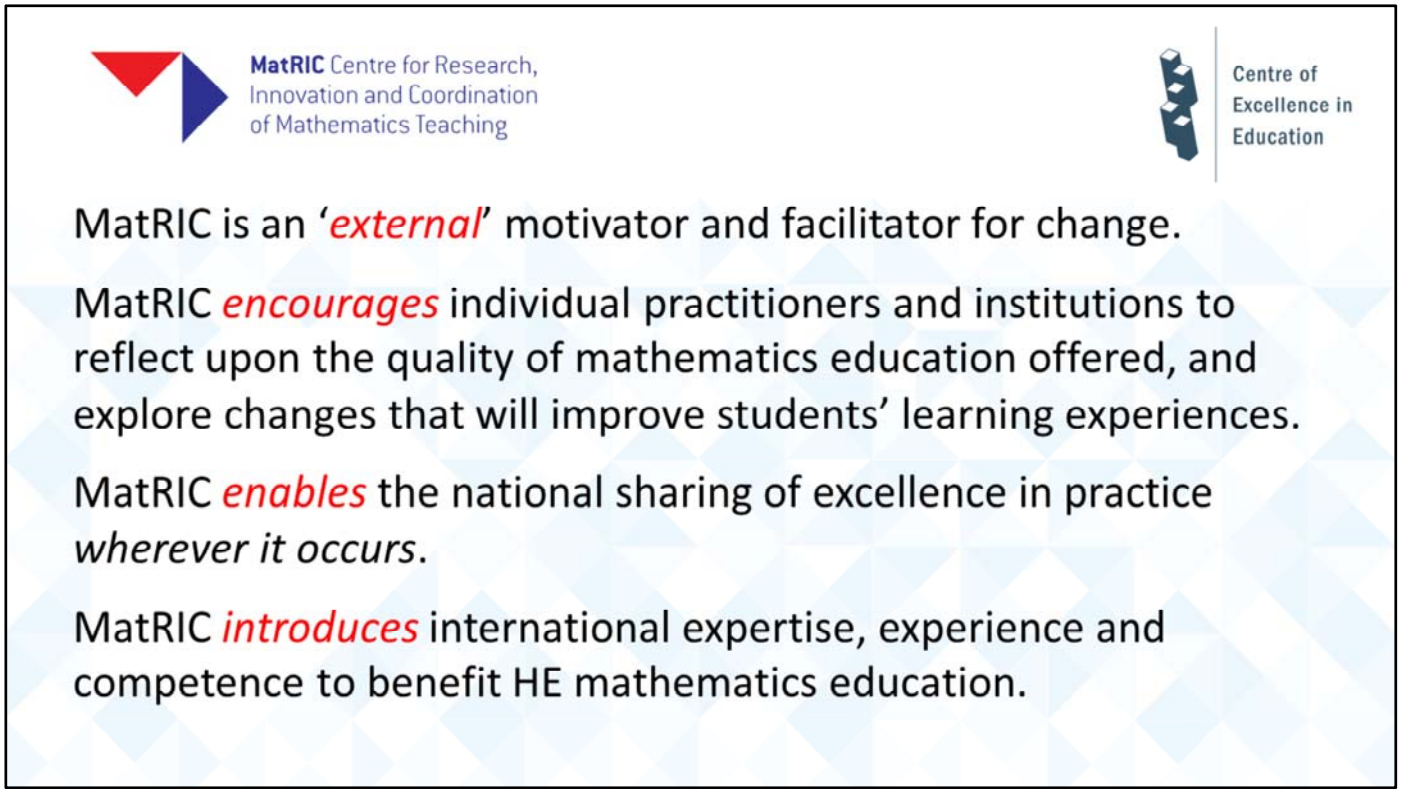
We thank the panel for the insightful feedback on the self-evaluation document. We are very pleased to receive their comments because they provide us with guidance for development and improvement.

We are thankful to NOKUT for assembling such a distinguished panel of experts. Throughout the three and a half years of MatRIC's life we have experienced our NOKUT colleagues as being 100% behind us and determined to support us to ensure the success, not just of MatRIC, but the SFU programme.

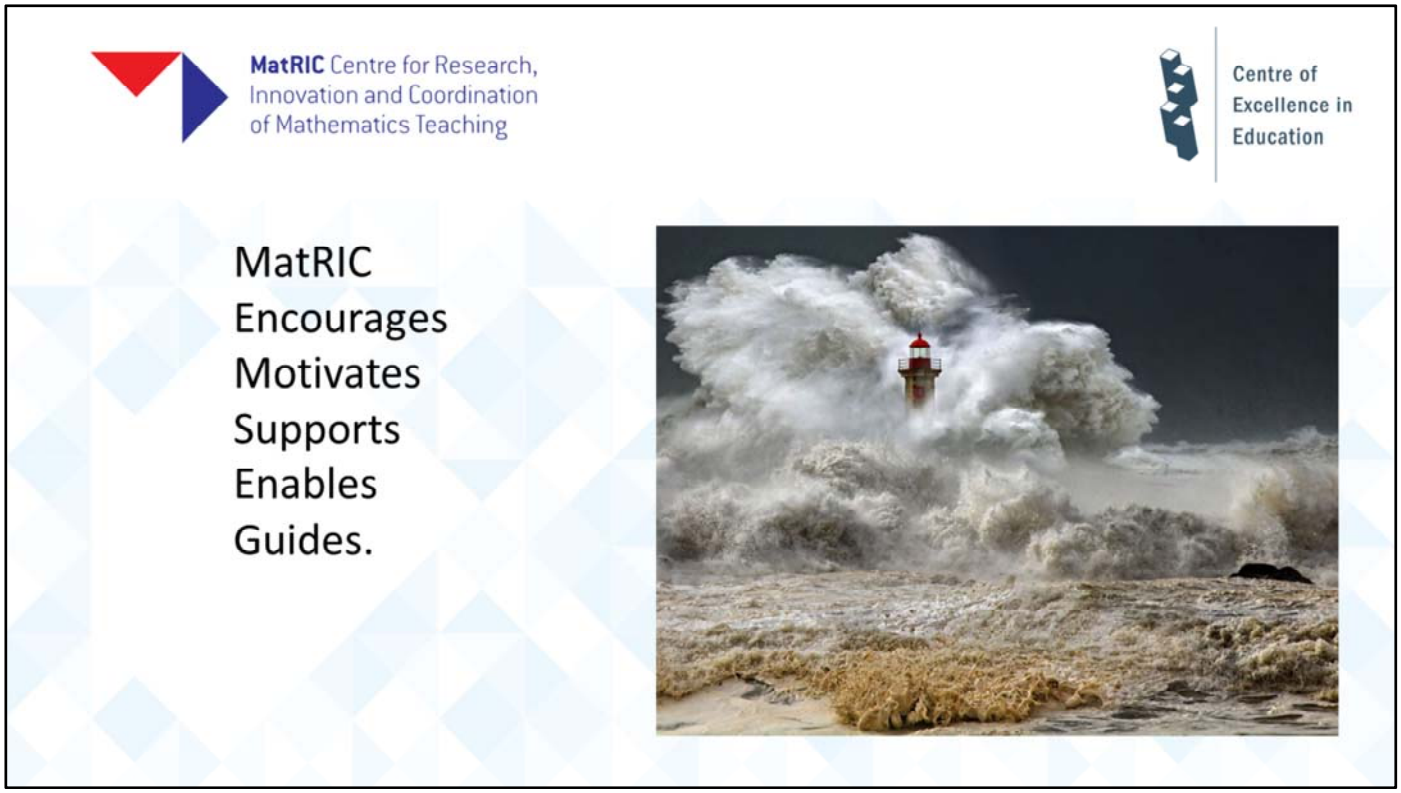


I will try to address many of the questions raised by the panel in the 'final review' by focusing on what MatRIC 'IS'.

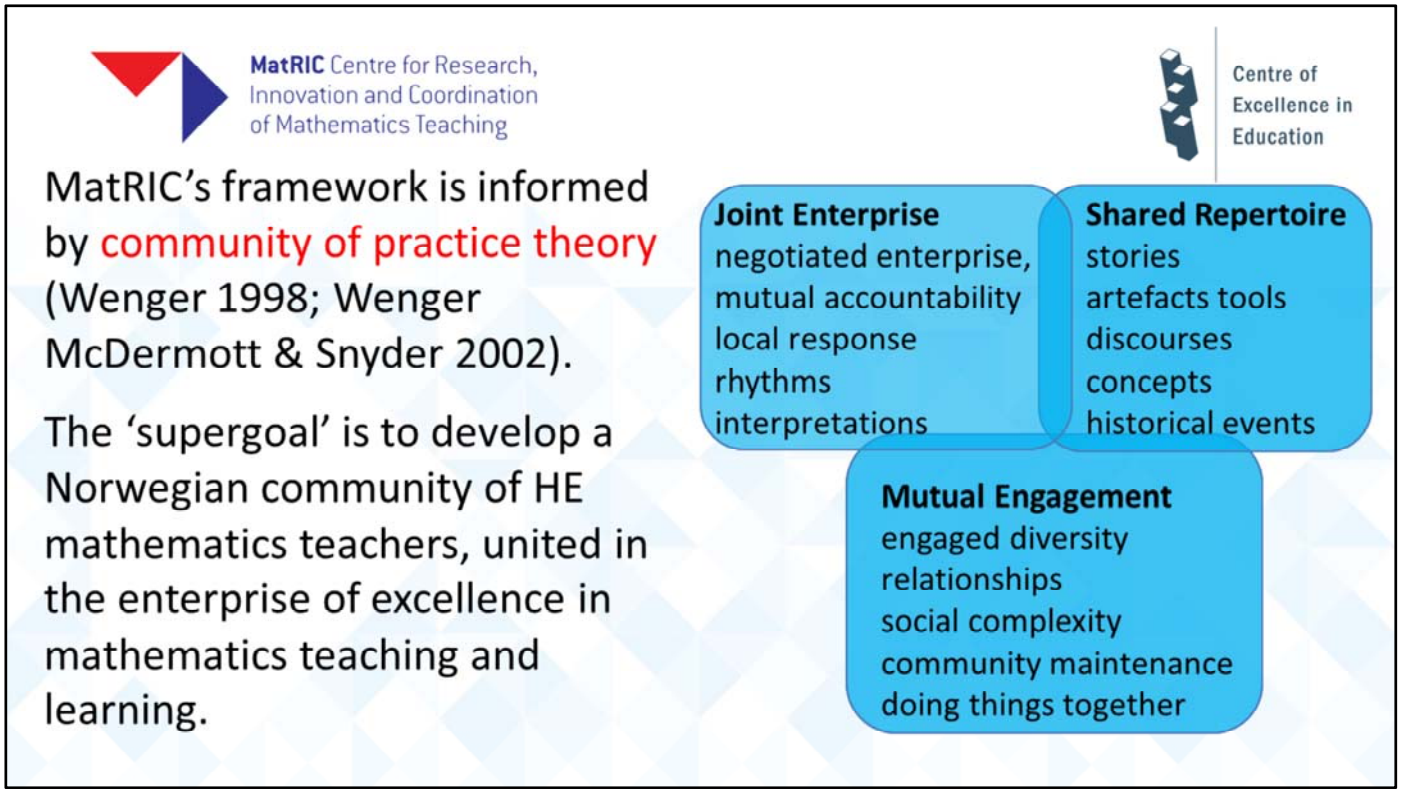
It is important to recognise that MatRIC IS working towards and achieving the goals set out in the project proposal. I refer the panel to additonal documentation, file name «07a Leader report response to IAB_MB October 2016» In this I set NOKUT's 2016 goals and expectations for SFU's alongside MatRIC's goals, objectives and actions. There is also a summary of an analysis of what has been achieved, an assessment of impact and the challenges that confront MatRIC. This document was prepared as a discussion paper for a joint meeting of the Management Board and MatRIC 'team' that was held in December 2016, following the International Advisory Board meeting in October 2016.



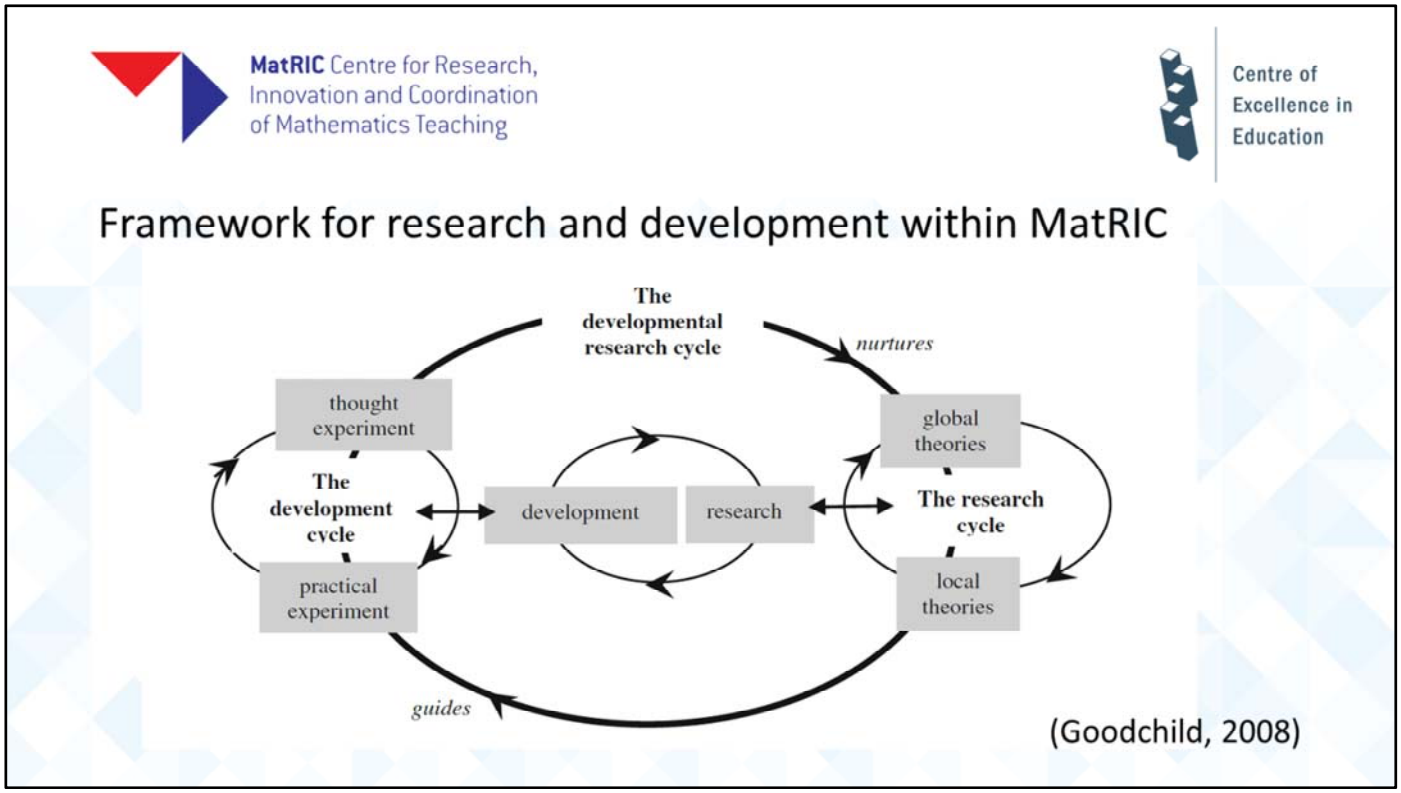
MatRIC lies outside the courses and programmes owned by departments, faculties and institutions. MatRIC's engagement with teaching and learning, with teachers and students relies on invitation. Dissemination of the message that MatRIC is a resource and agent for change permeates our activity.



MatRIC is also developing support structures for students, the intention is to emulate excellent practices (eg. **sigma** developed in the UK), as a Norwegian beacon. These support structures do not feature in this short presentation because I want to focus on some key issues within the 'final initial review'. I will, in addition, say something about "the nature of the involvement of students in the Centre's activities" that was requested with the additional information.



I have been researching mathematics teaching development for many years. Community of Practice Theory – offers an adequate 'organizing principle', it has limitations as principle for change and development. For that we have worked within a developmental research framework.



There are enormous and complex challenges faced by students and teachers of mathematics as a service subject in higher education. MatRIC's approach is based upon a developmental research cycle that was an outcome from previous projects at the University of Agder – led by Professor Barbara Jaworski – now at Loughborough University.

As a mathematics education researcher my interest lies especially in the right hand side of the diagram. As leader of MatRIC I see my role as one of 'guiding'. MatRIC is promoting mathematics teachers' action within the development cycle, which is characterised by planning-implementation-feedback-evaluation-reporting-new planning.

The fundamental belief or assumption underpinning this model is that (effective and sustainable) changes in teaching practice occur (only) when teachers engage in progressive, informed action and reflection on practice.

As an example: the evidence available indicates that our MatRIC colleague, Morten, is achieving outstanding results from his mathematics course in the electronic engineering programme (Study Barometer and records of students' performance). It is possible to point to many features of his practice that contribute to the students' success. Morten has spent many years developing a range of competencies to get to this point: developing computer aided assesment (CAA), making videos, engaging in an alternative teaching approach. He also has a textbook that is written for this type

of course, a relatively small group of students and access to a ‘self-service’ recoding studio on our Grimstad campus. Other teachers, who would be well-advised to adopt these features into their practice (if institutional constraints permit), also need time to develop the competencies, and achieve (if possible) the same teaching conditions. **Sustainable change arises as teachers work in a zone of their own competence development**. To attempt too much, too quickly drives teachers into a zone of incompetence that gives rise to frustration and resistance – MatRIC is **driving sustainable and meaningful change and development.**

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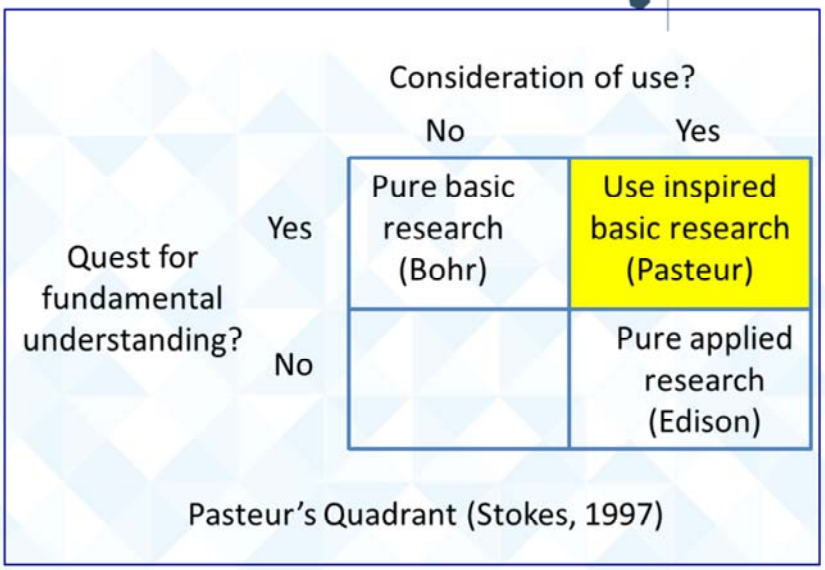
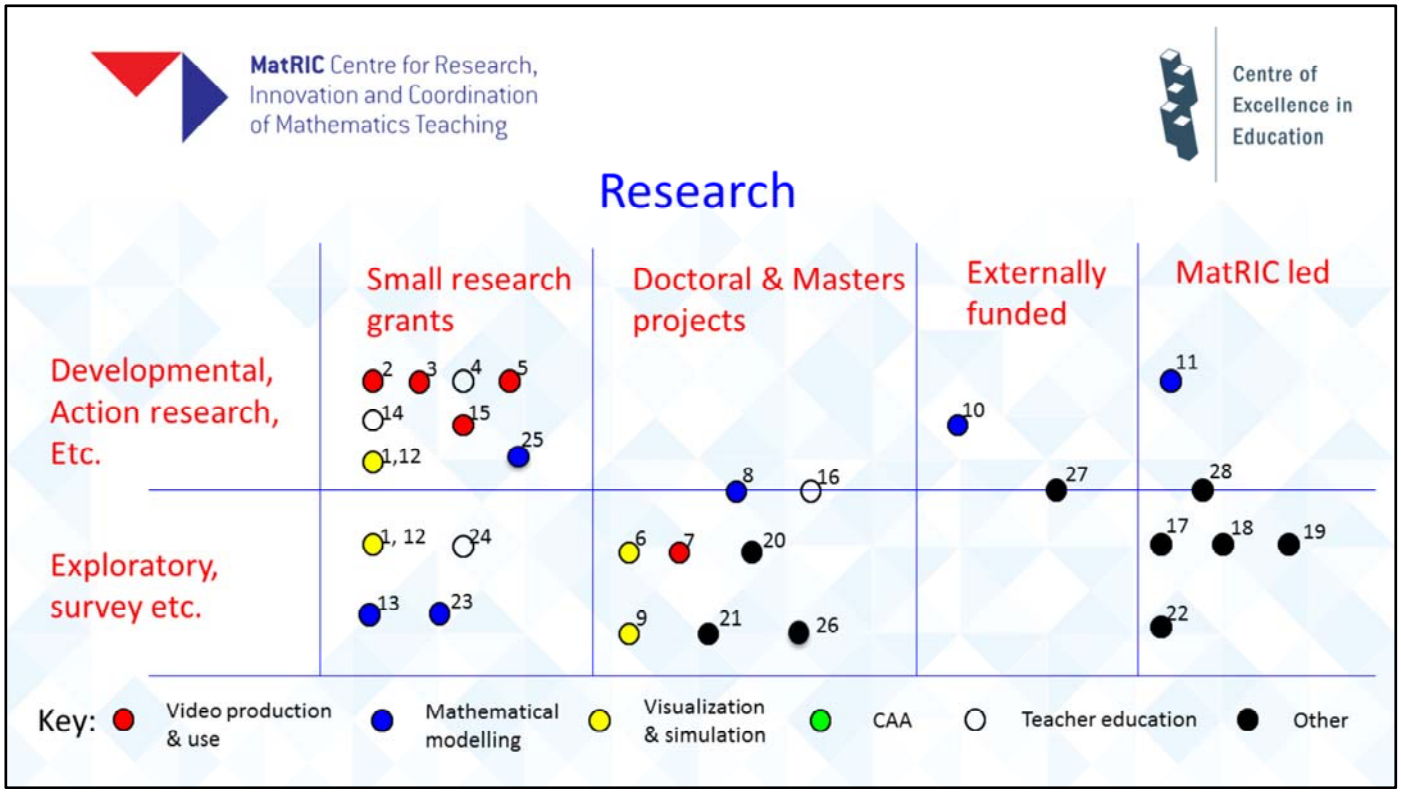
MatRIC supports research that informs teachers and learners of mathematics about effective and efficient ways of developing mathematical understanding and competencies needed in further study and employment.



MatRIC supports educational research that will have an impact on practice, and that leads to a better understanding of the conditions for change and improvement. Both at the individual teacher level and the Centre level.



1: Said & Per Henrik: Use of SimReal with teacher education students.
2: Christine Lindstrøm et al.: Use of Khan Academy resource within a teacher education programme.
3. HiOF: Flipped classroom approach
4. Kellrun HiB: Students presenting research
5. Ragnhild Johanne: Development of video tutorial that promotes relational understanding
6. Ninni Marie Hogstad: How digital tools can be used in learning integrals (curves and surfaces)
7. Helge Fredriksen: Flipped classrooms,
8. Yannis Liakos: Mathematical modelling,
9. Harald Hoven Gautestad: Masters project – engineering students learning through SimReal
10. NIL Norway project with Brno university of technology METMAS – mathematics education through modelling authentic situations.
11. Collaboration with bioCEED, UiB developing mathematical modelling approaches for biology students.
12. Replication of 1. with revised resource.
13. Collaboration YR, OV, PHM, ST: Mathematicians views of modelling
14. Kellrunn et al. HiB: Teaching and learning about indices and their application in society
15. bioCEED collaboration: development of video resource for teaching statistics.
16. Henrik – in teacher education

17. Olov – development of students' discourse in modelling contexts.
18. Olov – Role of mathematics in engineering programmes a comparative study across institutions and countries.
19. OV & EN – Mathematicians views of teaching mathematics to non-specialists
20. Shaista (PhD)
21. June & Magnhild (Masters) with Pat Thompson on mathematical meanings
22. Chris Rasmussen & SG
23. Mathematicans' views of modelling YR, OV, PHM, STT
24. Peer Andersen HSN: Hvilken forskjell er det på studenter etablert med familie og arbeid, og studenter som kommer rett fra videregående skole, når det gjelder bruk av videoer i matematikkundervisningen?
25 Thomas Gjesteland & Pauline Vos – mathematical modelling on Physics Lab. Course
26. Eivind Hillesund PhD
27. Erasmus+ proposal led by MatRIC, partners in UK, Czech Republic, Germany, Holland and Spain.
28. Host the 2018 INDRUM conference (April 5-7, 2018). (International Network for Didactic Research in University Mathematics).

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Student engagement

Partners in ...

- Teaching and development
- Research
- Mathematics teaching developmental research

Target population ...

- Learning support
- Inspiration and motivation

Partners in teaching and development:

Example	Informants
• Advisory groups	(student - Kim Roger),
• Partners in Learning	(student - Kai Steffen, staff - Lillian,
leader - Astrid),	
• Teaching and learning support	(student -Jon Bjarne, staff Morten and
Anne Berit)	
• Resource development	(student- Magnus, staff - Morten)

Partners in research

Example	Informants
Master dissertations	(student - Magnhild – unfortunately
could not be present)	
Masters course work	(student - Jon Bjarne, staff – Claire and
Said)	

Partners in mathematics teaching developmental research

Example	Informant
• Physics lab – mathematical modelling	(staff - Thomas)
• Bio-mathematical modelling at UiB	(students - Kim Andre and Linnea,
stakeholder/PhD fellow - Yannis)	
• Flipped classroom at UiT/Bodø	(students - Are Johan and Anders)

Students as target population

Examples	
Recipients of learning support	Drop-in, revision programme
Inspiration and motivation lecture series.	Teacher education workshop, open

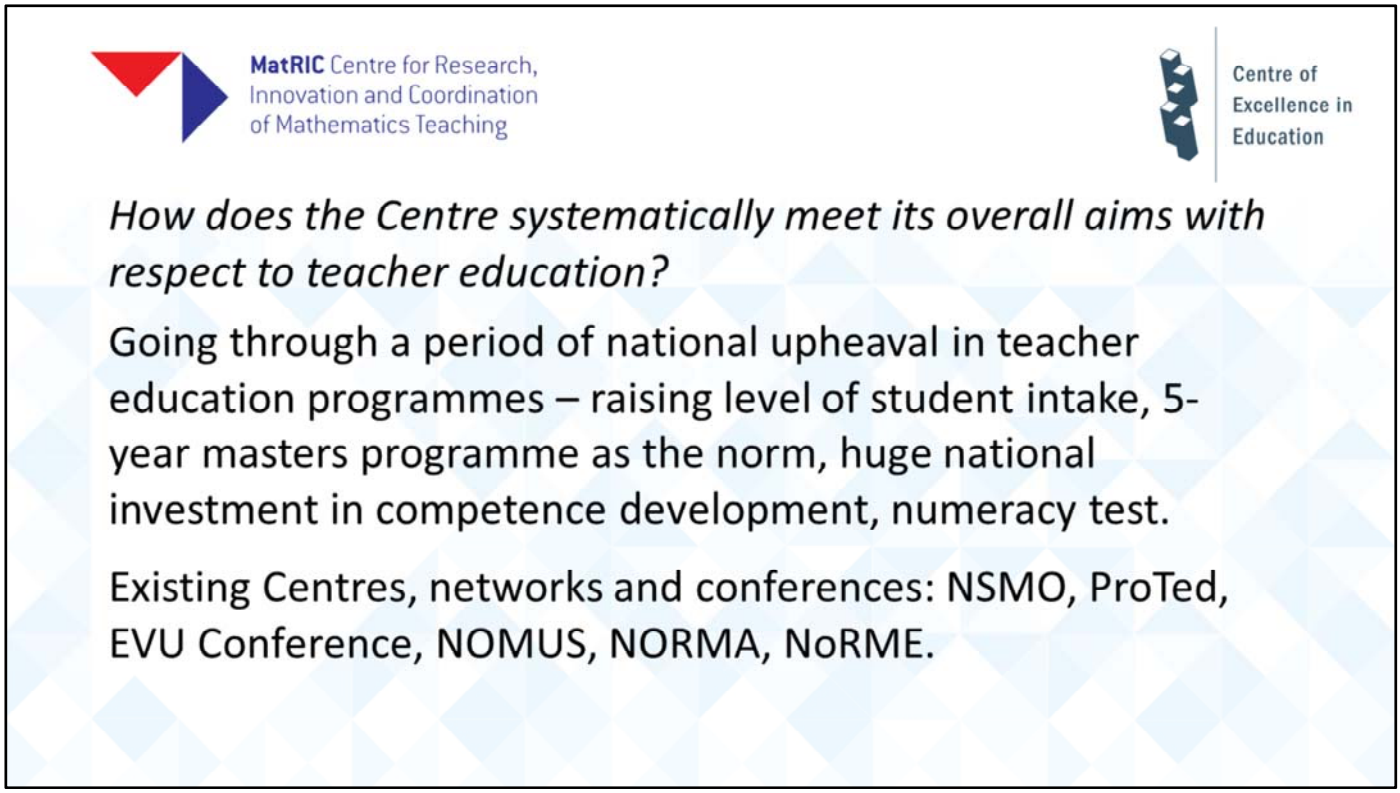
A very large proportion of MatRIC's effort, centrally and through the networks is about dissemination. The focus of the dissemination is to encourage teachers to engage in informed developmental inquiry within their own practice.

MatRIC takes events throughout the country – Tromsø, Narvik, Bodø, Trondheim, Bergen, Gjøvik, Oslo and Kristiansand/Grimstad. MatRIC's support for HE mathematics teachers covers the whole of Norway.

The events serve several functions:

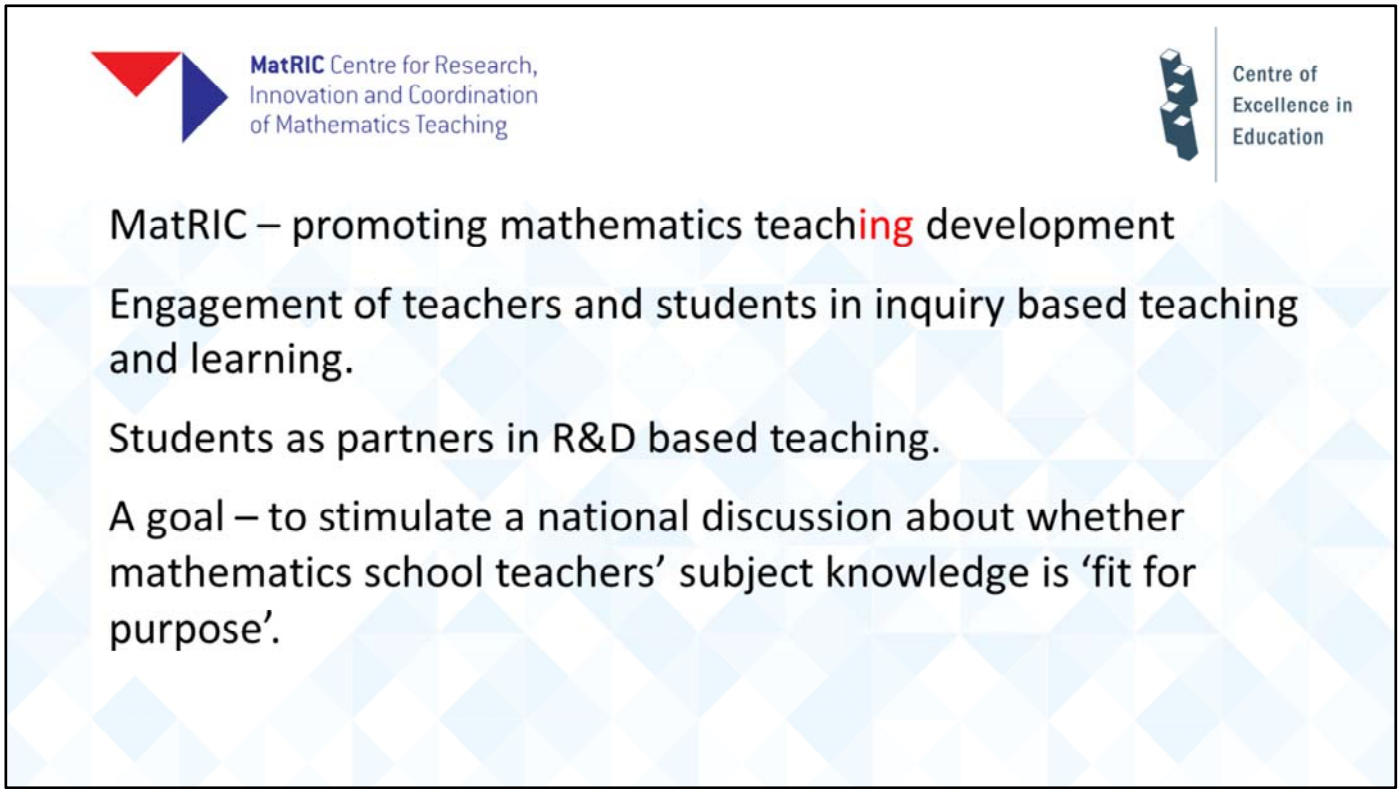
- Community building – especially bringing together mathematics teachers, mathematician researchers, mathematics education researchers and user programme teachers.
- Bringing international (research and teaching) expertise to the Norwegian community.
- A place for MatRIC networks to meet, to report their activity and to grow.
- A safe space for Norwegian teachers to report their innovative developmental inquiry – purposefully we have a low threshold.
- A trial space before presentation at an international conference.
- Cross-fertilization of examples of excellent practice between individuals and institutions
- A place for students' to present their innovations.

The events have introduced expertise from many other countries. The UK is heavily represented partly because of the very well developed community in the UK that has emerged from the CETL programme, HEA (and the erstwhile ILTHE), IMA , partly because within MatRIC we are very well connected with the UK network, partly because of language.



The 'period of upheaval' coincides with the new government and administration that came into power in autumn 2013. It is excellent to note the effort and attention being given to mathematics teacher education, and it creates a special context within which MatRIC has developed, and to which MatRIC contributes.
The government is pumping huge amounts of money into mathematics teach**er** development. MatRIC contributes with mathematics teach**ing** development; this is a practical and ethical stance.

MatRIC also aims to complement the existing professional network and provision for mathematics teachers and mathematics teacher educators.



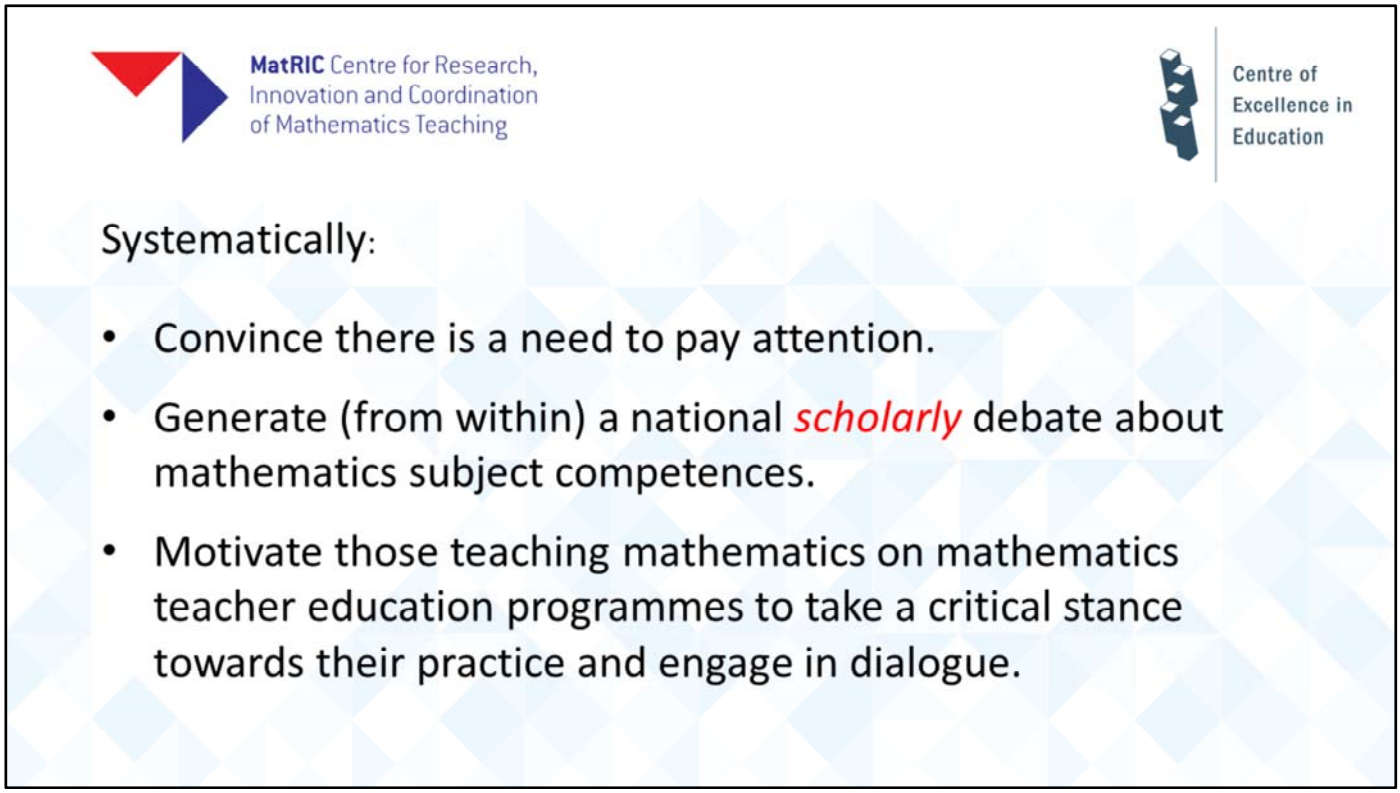
Engagement of teachers and students in inquiry based teaching and learning.

Inquiry based teaching project at UiA

Students as partners in R&D based teaching.

Small research grants – Oslo & Akershus group, Østfold group, Bergen group, UiA group

A goal – to stimulate a national discussion about whether mathematics school teachers' subject knowledge is 'fit for purpose'.



MatRIC is working on these challenges ... Systematically

A goal is to stimulate a national discussion about whether mathematics school teachers subject knowledge is 'fit for purpose'.

Teachers' mathematical meanings project is a collaboration with Arizona State University (ASU), includes two master dissertations (supported by NOKUT stipends).

We have taken a research instrument developed at ASU to explore teachers mathematical meanings and translated this into Norwegian. As an initial pilot study we have used this instrument with teacher education students who have, at least, the minimum qualifiaction for teaching mathematics as a specialist subject.

Students from three universities have participated as informants. Results achieved so far reveal reveal students' communicating erroneous meanings, and inconsistencies in the meanings they communicate over a range of tasks.

The intention is to use this information to generate a scholarly debate, free from the media frenzy that often accompanies publication of such information and causes teachers to raise the defensive barriers.

NOKUT has promoted the SFUs to be recognised as a national resource.

In addition to the details recorded on the slide, MatRIC has contributed to workshops at the Ministry of Education and Research.

I have presented MatRIC to the Prime Minister, and on another occation to the parliamentary committee for education.

Next week I will be at The Research Council of Norway, MatRIC's contribution to the national research effort is high on my list of priorities.

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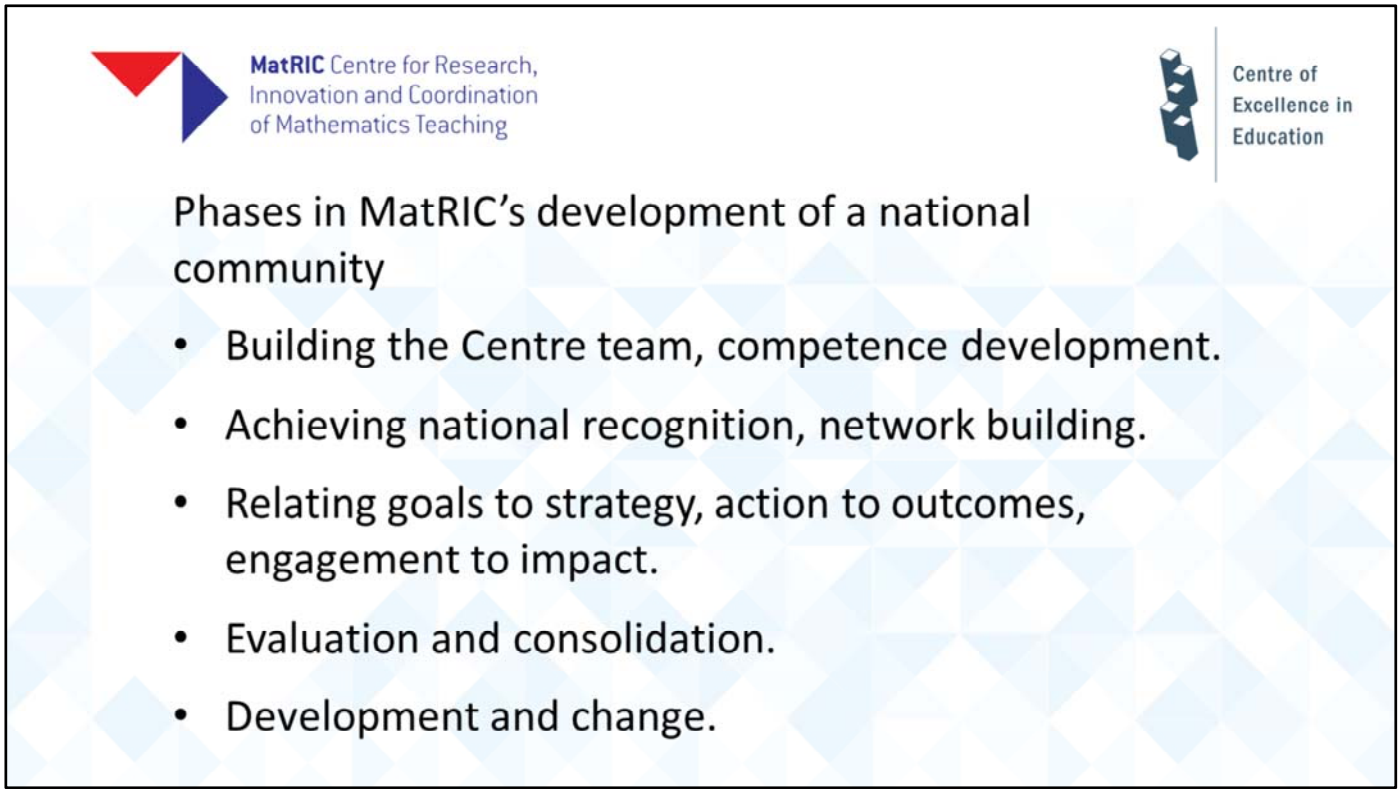
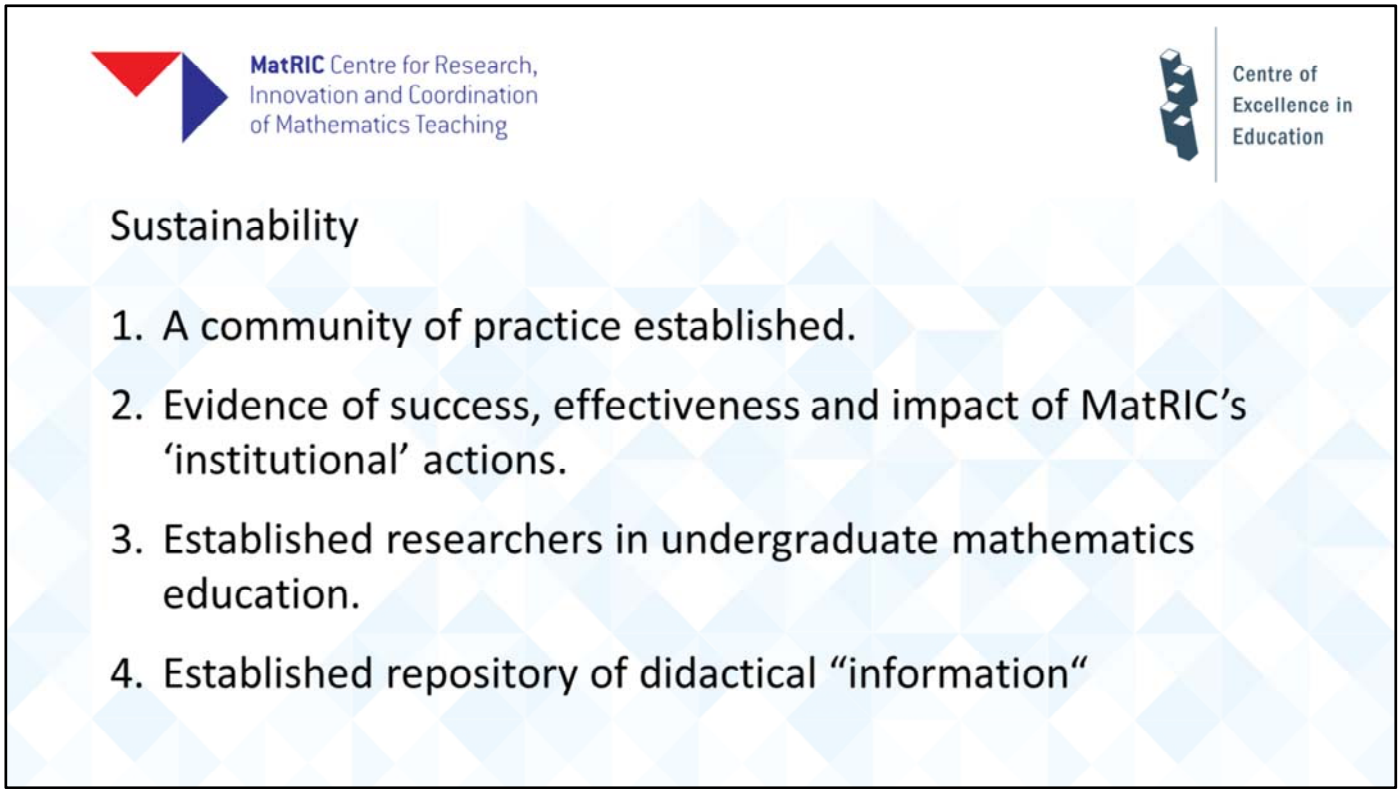
At a local level:

- MatRIC has contributed to the development of the university's strategic plan, which was adopted about 12 months ago.
- MatRIC is now contributing to the actions to implement the plan at both steering board and working group levels.
- MatRIC is introducing international expertise (through MatRIC's network) to contribute the university's developmental process.



In a short period (three years) MatRIC has achieved a lot. The team I am proud to lead combines many competencies and personalities, all share a deep desire to achieve excellence in mathematics teaching and learning, and enthusiasm to see MatRIC flourish. They are great companions in the journey confronting MatRIC's challenges. I am confident that by the end of this morning's meetings the panel will be impressed by the positive attitudes and approaches. I hope the panel will be able to provide the team with some encouragement!



The following notes are suggestions from one member of MatRIC's International Advisory Board, Prof. Dr. Burkhard Alpers:
Categories of sustainability:

- Sustainability of MatRIC's activity as a means for excellence in mathematics education within user programmes.
- Sustainability of specific concepts and related measures regarding the mathematical competence of students (e.g. long-term effect of bridging courses or of support centres); for this, longitudinal studies on the success of measures are required.

Aspects of sustainability of MatRIC's activity:

1. A community of practice established in which there is didactical reflection on and exchange of ideas, concepts and practices related to the mathematical education in user programmes.

- Annual conferences that can be retained with little effort after the end of the project, or absorbed into other arrangements (e.g. MNT(STEM) Conference)
- Networks of HE teachers, each with a critical mass of motivated/dedicated people in order to avoid vanishing after the end of the project.
- Durable, long-term relationships created through establishing common projects (e.g. Erasmus+ proposal)
- Inclusion of newly appointed colleagues from start on through actions such as induction teaching courses

2. Evidence of success, effectiveness and impact of MatRIC's 'institutional' actions

(such as Drop-in support centre, induction course) such that they cannot easily be closed down at the end of NOKUT‘s financial support

3. Established researchers in undergraduate mathematics education to facilitate applications for finance within other programmes based on a research record of competence gained within MatRIC
4. Established repository of didactical “information“ that can be used (and maintained with minimal effort) after the end of the project. Possible content to include:

- Information on innovative learning arrangements
- Information on how to enable student teaching assistants to act effectively
- Information on learning materials like suitable project themes, simulation tasks, tasks in CAA,
- …
- Information on video production

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Thank you!