MatRIC Centre for Research, Innovation and Coordination of Mathematics Teaching

MatRIC Action Plan for Phase 2

Appendix

Appendix Part 1. Figures

MatRIC's focus

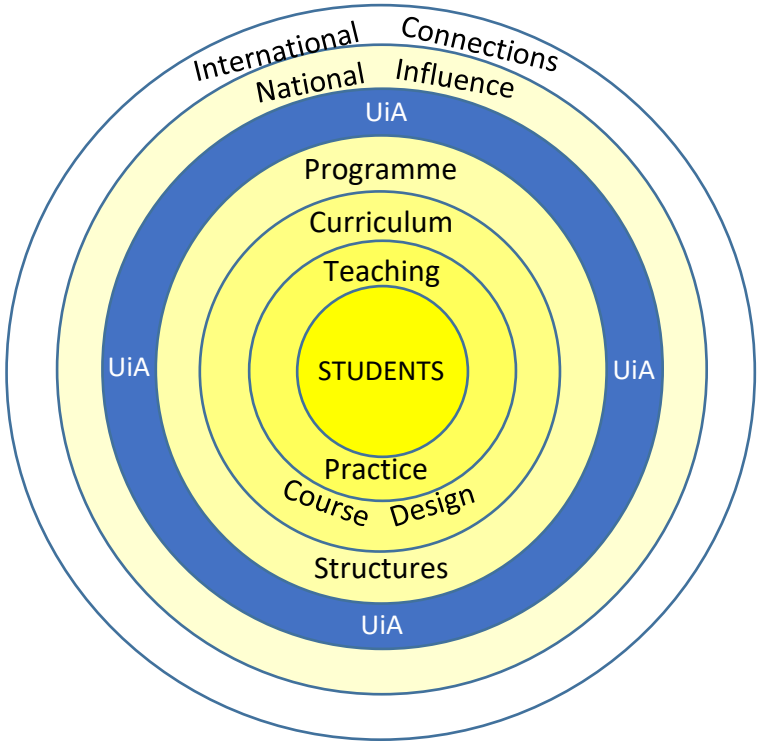

Figure 1: MatRIC's focus and expanding field of vision

MatRIC's focus: Students at the centre, their transformed experience is dependent on high quality teaching, which takes place within the context of course and programmes designed for educational excellence. MatRIC's primary actions to transform students' learning experience provides exemplars and prototypes for educational development within the University of Agder (UiA). MatRIC's primary actions to transform teaching is designed to include mathematics teachers from all Norwegian HE institutions and international leaders in teaching mathematics and university level mathematics education research. In Phase 2 MatRIC will use the networks of national and international teachers and researchers to influence policy and practice at national and international levels.

The coherence between MatRIC's vision and UiA's strategy:

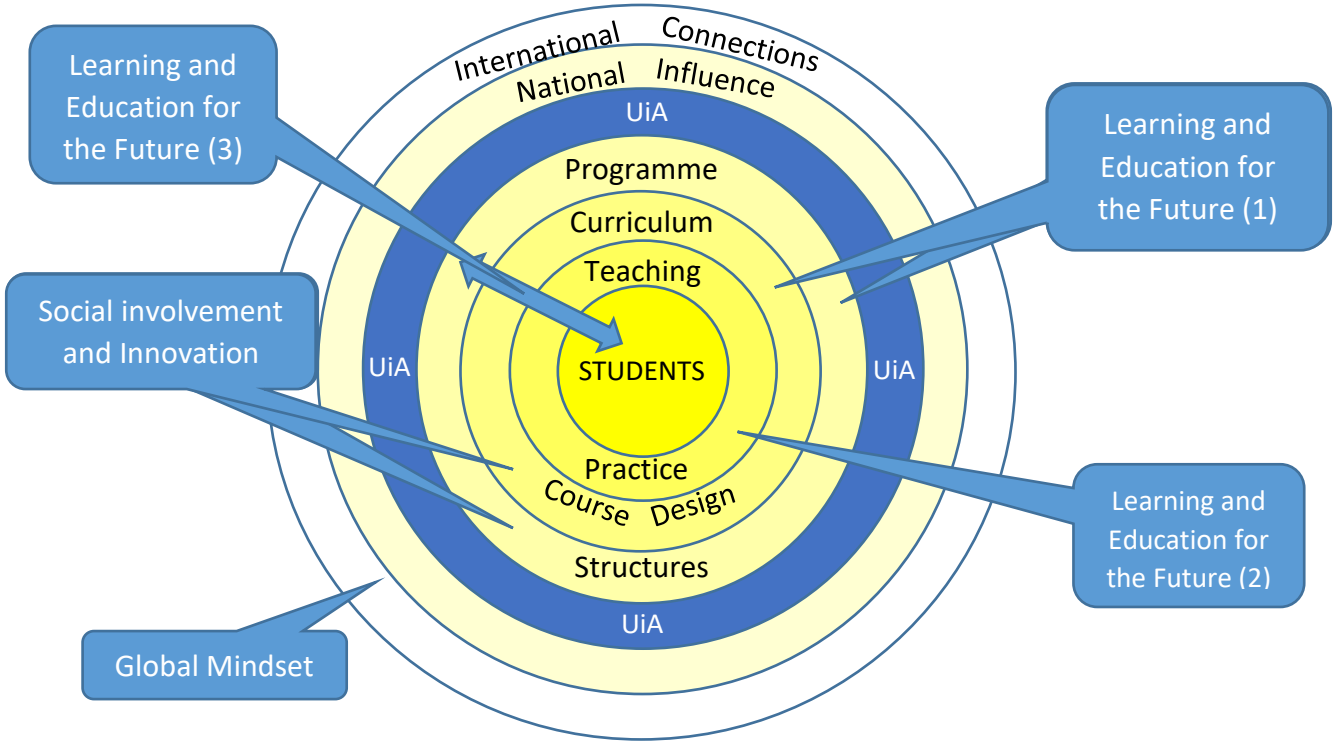

Figure 2 MatRIC's contribution to UiA's strategy. The blue 'callouts' show the coherence of MatRIC's vision with UiA's strategy. UiA's vision is Co-creation of Knowledge and the strategy has three focus areas: Learning and Education for the Future; Social Involvement and Innovation; and Global Mindset.

Central pillars of MatRIC's objectives

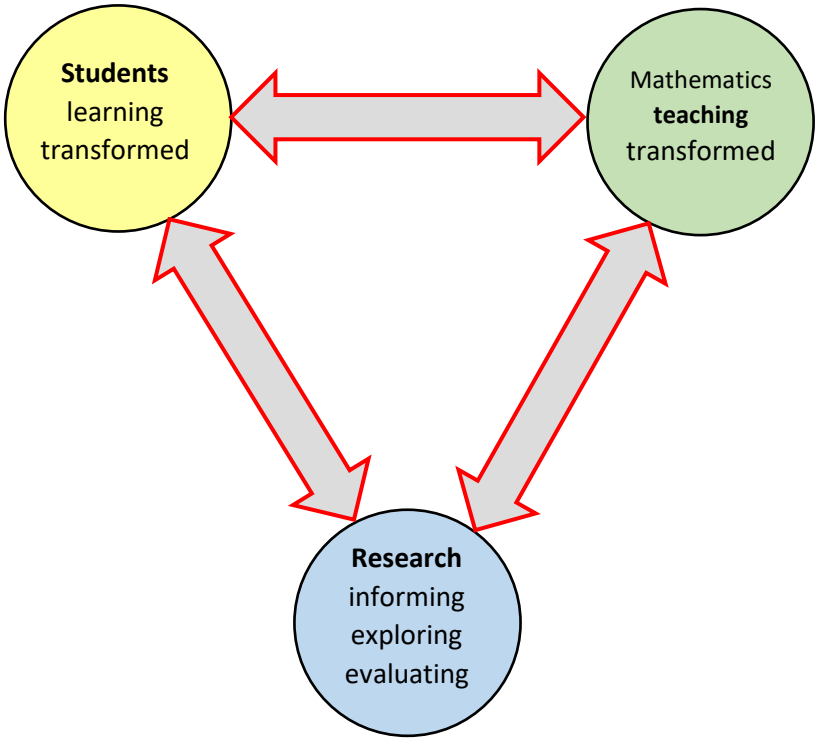

Figure 3. MatRIC's primary objectives: (1) transformation of students' learning, (2) transformation of teachers' teaching, (3) applied research that informs, explores and evaluates mathematics teaching and learning in higher education. Reaching these objectives will advance Norwegian mathematics education towards MatRIC's vision, and ***Norway will be a global leader in HE mathematics learning, teaching and research.***

MatRIC's interconnected objectives

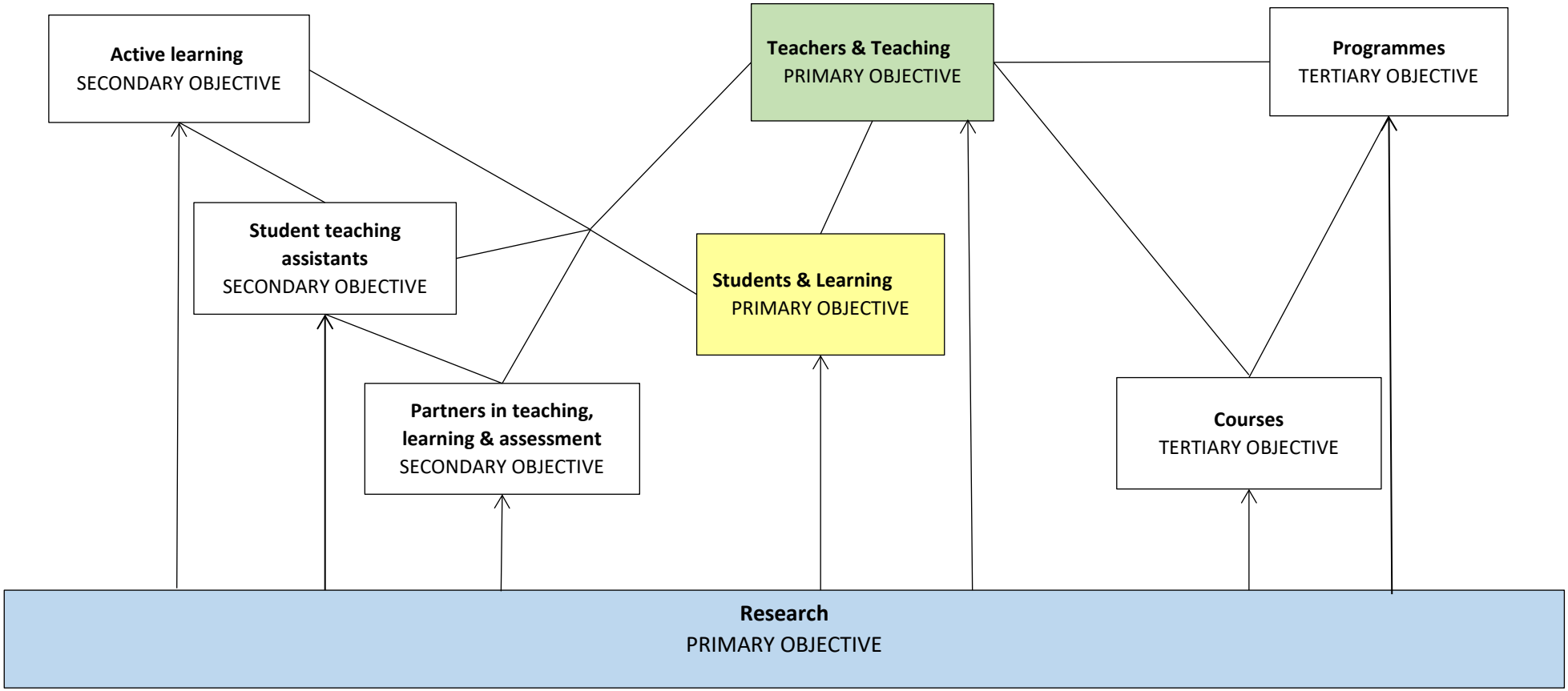

Figure 4: MatRIC's Primary & Secondary objectives and (tertiary level) objectives for 'influence'.

Summary of MatRIC's actions proposed for Phase 2

Action	Goal	Intended outcome	Implementation	People involved	Responsible	Evaluation	Contribution to UiA
Actions directed towards students							
4.1.1: MatRIC TV	To support students' transition from school to HE mathematics.	Students better prepared to engage with HE mathematics content.	Recordings of phase 1 nearly complete. Marketing is prioritized.	Students Mathematics teachers Student interns	TV production group drawn from several Norwegian universities. UiA studios.	Viewing metrics. Student evaluation questionnaires	MatRIC creates models and prototypes that UiA will use in informing, motivating and leading the strategy 'Learning and education for the future'. MatRIC's development of Drop-in learning support provides a model and experience for the development of the proposed UiA centre for learning and teaching. Mathematics subject focused development of didactical competencies for Student teaching assistants can be copied into other subject areas in which STAs are used.
4.1.2 Drop-in support.	To provide one-one tutorial support for students struggling with mathematics.	Students feel more secure when challenged by mathematics and are ready to engage with challenges because of the existence of learning support.	Target for these actions are UiA students, especially 1st year. The challenge is in making the actions known and getting students to engage. The above actions are advertised on screens in places where students gather, flyers, and announcements in classes will be used. Boxes for depositing compulsory assignments located in the Drop-in draw students to the location, 'coffee & cake' open days, and further efforts to engage with the student body and attract them to	Students, tutors (mathematics teachers, student teaching assistants)	Drop-in leaders. MatRIC leadership, UiA communications department and student organization for marketing.	Student evaluation questionnaires. Usage metrics	
4.1.3 Open lecture.	To present a 'popular' and accessible image of mathematics and studying mathematics.	Students more motivated to engage with mathematics.		Students	MatRIC leadership.	Attendance metric	
4.1.4 Mathematics study skills course.	To motivate students' engagement in mathematics and to develop the study and thinking skills needed when studying university mathematics.	Students as more effective and efficient learners of mathematics.		Students, mathematics teachers, mathematics education researchers	Study skills course leader.	Student evaluation questionnaire	

			make use of the resources provided are used.				MatRIC's development of on-line questionnaires for students' course evaluations is a model to be used across the university.
4.1.5 Student Teaching Assistant (STA) development. 4.4.1. Summer training camp. 4.4.2. Regular mentoring of STAs.	to improve the didactical and pedagogical competencies of mathematics STAs. to build the team of STAs that will strengthen their resolve to provide high quality teaching and learning support. to engage teachers effectively in those parts of course provision devolved to STAs. To strengthen educational partnership between teachers and STAs.	Students experiencing teaching and learning approaches of consistently high quality. Students experience higher levels of satisfaction, enjoyment and personal achievement in their mathematics studies. Teachers recognition of the value of STA's contribution, teachers responsive to experiences of STA's meetings with students, students experiencing teaching and learning approaches of consistently high quality. Teacher's increasing awareness of the	STAs recruited from high performing advanced undergraduate and masters students through e-mail distributed by Examinations Office	Students UiA staff – MTs, MERs, PULS staff.	Course leaders Mathematics teachers	Student evaluation questionnaire	

		value and effectiveness of student peer mentoring and increasing readiness to explore other areas in which students may share in teaching, learning and assessment more generally.					
4.1.6. Student internships. 4.5.1 4.5.2	To develop resources that will stimulate change in teaching and learning. To demonstrate the potential of students as contributors to their education.	Resources that are of value in R&D based, innovative, active learning approaches. Teachers are more aware of students as producers of knowledge and resources, students experience greater involvement in their studies.	undergraduate and masters students through e-mail distributed by Examinations Office following successful experience at UiA, and the example of the sigma network in the UK MatRIC can initiate a national competition to fund a small number of internships in other Norwegian HEIs, these internships would need to be focused on MatRIC's vision.				
Actions focused towards mathematics teachers							
4.2.1. Innovation networks	To develop a Norwegian expert	A sustainable critical mass of	Target all Norwegian HE	Mathematics Teachers	MatRIC leadership	Event evaluations,	MatRIC's promotion of

4.6.2	group and facilitate exchange of ideas, resources and experiences of good, innovative, R&D based practice. To support MTs and student groups on an inward trajectory of participation in MatRIC's CoP focused on transforming and improving students' learning experiences.	networked HE MTs that stands as a pool of expertise in innovative mathematics teaching. Sharing and replication of innovative teaching between MTs and across HEIs.	mathematics teachers. opportunities to participate in these actions are announced through MatRIC's channels of communication, by MatRIC Ambassadors, and local coordinators Networks are facilitated and nourished by workshops, seminars conferences etc. The challenge to broaden participation is shared by MatRIC's dissemination media, Ambassadors and local coordinators (see below Section 4.7). Another challenge is to establish programme networks, this will be achieved through targeted events with international leaders and recruitment to	International guests Students	Network coordinators Conference programme committee	Participation metrics	innovative, R&D based education, and student participation creates examples and models that promote actions elsewhere.
4.2.2. Programme networks.	To develop Norwegian expert groups and facilitate exchange of programme specific innovation and good practice in mathematics teaching.	A sustainable critical mass of networked HE MTs that is competent to contribute authoritatively to the development of courses, programmes and curriculums.					MatRIC's influence within UiA in course and programme development will be strengthened through the collaboration in these networks.
4.2.3. Mathematics teaching Induction course.	To improve the quality of teaching of recently appointed HE mathematics teachers, to stimulate interest and inquiry in teaching HE mathematics, to	MTs with basic didactical competencies that will support continued professional development, a prototype for subject specific didactical provision					MatRIC is creating a prototype for university level didactical education. This will form an important element in UiA's teaching accreditation award scheme. For

	raise the status of teaching HE mathematics, to contribute to community building as new participants join the enterprise of HE mathematics teaching.	for HE teachers that will contribute to the Norwegian effort to give accreditation for good teaching in HE.	serve on programme specific expert panels				MTs. There will be a demand for similar support from other areas, otherwise MTs will be seen to be in an advantageous position.
4.2.4. Mathematics lunches.	to facilitate a discourse about teaching and learning mathematics.	MTs meeting regularly to discuss issues about teaching and learning mathematics.	Discussion about teaching and learning. Development of MT community at UiA		Mathematics teachers	Participation. MTs decide when they want to meet, metrics about meetings, informal reports of discussions	A simple model for teaching development within a CPT framework.
Actions focused towards research							
4.3.1. Research seminars and workshops.	To support the MatRIC research group at UiA, to support, encourage and develop a Norwegian community of researchers of university mathematics education.	(a) Literature reviews that inform other MatRIC objectives and actions; (b) high quality research, reported in international journals, conferences and research monographs contributing to knowledge about teaching and learning mathematics at HE; (c) evidence for 'MatRIC white papers'; A	Organised by the research group (PhD and post-doctoral fellows) in collaboration with MatRIC's research coordinator.	Community of Norwegian HE mathematics teachers, MERs focusing on university mathematics teaching, and students.	Led by MatRIC's research coordinator	Production, quality and quantity of published reports. MatRIC's dissemination of research, opinion, and argument based on authoritative, informed and respected expert groups of practitioners (Ms, MTs, MERs & students)	Exemplary of active research groups that UiA is promoting throughout the university.

		nationally connected community of researchers that is well-connected to the international network of researchers of university mathematics education (INDRUM, RUME, sigma, KHDM).					
4.3.2. Small R&D grants. 4.6.1	To stimulate MTs to engage in R&D projects that focus on MatRIC's vision within their own teaching. To encourage MTs to engage in innovative teaching approaches.	Partnerships between MTs, MERs and students working on teaching and learning development Reports with empirical evidence from innovative teaching, R&D based teaching, active learning, etc. Systematic reflective inquiry into practice becomes a norm for HE MTs.	Announced through MatRIC's channels of communication, reinforced by Ambassadors and local coordinators.		Scientific advisor: MatRIC research coordinator		Promoted within UiA to support teaching development, collaboration across fields of scholarship (MTs, MERs). A model to be copied elsewhere.
4.3.3. International engagement and networking.	To lift Norwegian research in university ME to international levels of excellence, to contribute to the creation of	Scientific papers and reports in international journals and conferences. International	Support to attend conferences where there is a focus on researching university level mathematics education or				A model for UiA's strategic focus 'Global mindset'.

	knowledge internationally.	exchange of researchers.	innovative teaching approaches				
4.3.4. Systematic inquiry into MatRIC's actions.	To ensure innovation promoted by MatRIC is research based, informed by scientific evidence and systematically evaluated.	Evidence based reports exposing students' learning experiences and outcomes from innovative teaching and learning as well as MTs regular practices.	PhD research, masters and bachelor level studies identified and supported by MatRIC coordinators, leaders, research supervisors and those engaged in MatRIC's actions.				MatRIC's approach to systematic inquiry into innovation and actions to explore teaching and learning is a model to be used to promote similar action across UiA.
4.3.5. White papers. 4.7.1 4.8.1	To inform and influence policy and practice especially relating to the provision of mathematics as a service subject in Norwegian HEIs.	Evidence based reports from recognised expert groups of national repute.	To be decided by a working group set up for this purpose. Implementation is likely to involve MatRIC's research groups, innovation and programme networks.		Small working group set up by MatRIC leadership to plan implentation		Will be used to support MatRIC's arguments to influence practice at UiA.
4.5.3. Engaging with and learning from external networks.	To connect with and learn from international experience.	MTs participating in international groups such as RAISE and ISISP.	Leading and encouraging participation in the international events and inviting leaders from RAISE and ISISP to present at MatRIC events will be used to mobilise action.	MTs and students	Initially MatRIC leadership.	Engagement in external networks will be evaluated by basic metrics of participation, and also on evidence of changes in practice and discourse about teaching, learning and assessment. A good outcome from this action would be several pilot studies in which teachers	MatRIC provides a model of student-teacher partnership to be used to influence other areas of the university.

						undertake carefully controlled experiments with students as partners in learning, teaching and assessment.	
Actions focused towards maintaining contact with the Norwegian HE mathematics education community							
4.7.2. Ambassadors.	To extend MatRIC's reach and communicate MatRIC's vision, agenda and opportunities for engagement and For MatRIC to learn about innovative practices in other HEIs	Presentation of MatRIC within every Norwegian HEI mathematics provider within a 2,5-year period. Increased participation in MatRIC's activity.	Ambassadors' visits will be initiated either by requests from the Ambassador or MatRIC leader, or invitation from an HEI – the possibility of such visits will be advertised.	Ambassadors appointed by MatRIC	Management Board for appointing Ambassadors. MatRIC leadership and Ambassadors responsible for making contact with the user community.	Evidence of the use and influence of the white papers in discussions about course structure and content. Invitations to MatRIC to contribute to national discussions about policy and curriculum. Also, Ambassadors' success to reach HE Ms and MTs throughout Norway, the attraction of an ever widening and varied participation in MatRIC's actions, the existence of a comprehensive network of local coordinators.	
4.7.3. Local coordinators.	To have a known and relatively stable contact person within each local HE community of MTs.	Improved communication of MatRIC's activity and increased participation in MatRIC's actions. Improved dissemination of MatRIC's products (reports, and learning resources).	Recruited through existing contacts, events and ambassador visits.	MTs in Norwegian universities.	MatRIC leadership, network coordinators, Ambassadors and other contacts to identify possible coordinators.		
See also dissemination report below.							

Dissemination (Copied from 2016 Annual report)

MatRIC has four intertwined strands of dissemination, each serving a different purpose: 1. Awareness, 2. Understanding, 3. Action, 4. Self-generating sustainable development.

Dissemination for Awareness

MatRIC web site

Content: announcements of MatRIC events, reports of MatRIC activities, repository of MatRIC resources, source of information about MatRIC.

Message: MatRIC is a busy 'Centre', a resource that seeks to serve the Norwegian community of mathematics teachers working in higher education.

Target group: All stakeholders – mathematics teachers, students, policy makers, institutional leaders.

MatRIC Newsletter

Content: Short text pointing to recently posted announcements or articles on MatRIC web pages.

Message: Brief statements about what is new in MatRIC.

Target group: All stakeholders, distributed to those who have signed up to receive the Newsletter and anyone who has attended a MatRIC event. It is possible to 'sign-up' at www.matric.no.

Social media (Facebook)

Content: Brief announcements of what is happening.

Message: MatRIC is busy 'NOW'!

Target group: Friends of MatRIC – who we hope will forward to a wider group of 'stakeholders'.

INFOMAT (On-line Newsletter of the Norwegian mathematical Society)

Content: Brief announcements of MatRIC's programme and events.

Message: Invitation to participate in MatRIC activities.

Target group: Mathematicians and mathematics teachers in Norwegian higher education institutions.

alle@matematikknettverket.no (e-mail list used by mathematics teacher educators in Norway)

Content: Brief announcements of MatRIC's programme and events that are relevant to mathematics teacher educators.

Message: Invitation to participate.

Target group: Mathematics teacher educators working in Norwegian institutions of higher education.

SFU Magazine

Content: Articles about SFU activity

Message: Excellent practice in teaching and learning in higher education – student engagement, student as partners in learning, research and development based education.

Target group: All stakeholders (Policy makers, leaders, teachers and students) in the Centre for Excellence programme and those who aspire to be awarded Centre for Excellence status. Also an international readership to display a Norwegian 'flagship' educational development programme.

Personal contact

Content: Information about MatRIC events.

Message: Invitation to participate.

Target group: Mathematics teachers and others working to develop the quality of mathematics teaching and learning in higher education.

Dissemination for Understanding

Workshops, colloquiums, symposiums, seminars, conferences,

Content: Reports of Innovation, reports of research into innovation and developmental efforts carried out in Norway and internationally.

Message: Inspirational and explanatory. To stimulate research, innovation, development and networking amongst higher education mathematics teachers.

Target group: Mathematics teachers (and students) in higher education.

Journal articles

Content: Scientific research papers.

Message: New knowledge about quality of effectiveness of alternative approaches to teaching and learning mathematics at university.

Target group: Mathematics education researchers and teachers.

Mathematics Teachers' Lunches

Content: Conversation

Message: Informal reports of what is happening in colleagues' classrooms, assessment approaches etc.

Target group: Local community of mathematics teachers working on the same campus.

Dissemination for Action:

Networks' activities (other than events),

Content: Innovation and research actions.

Message: Join in partnership of activity for joint enterprise, mutual engagement and the development of a shared repertoire (based on Community of Practice Theory).

Target group: Mathematics teachers in institutions of higher education, and students.

Induction Teaching course

Content: Approaches and didactical techniques related to teaching mathematics in higher education, to large groups and as a service subject. Innovations in teaching, learning and assessment using modern and emergent technologies.

Message: Effective teaching needs to be reflective, resourceful, creative and informed by best/excellence in practice.

Target group: Newly appointed teachers of mathematics in higher education institutions.

Dissemination for self-generating sustainable development:

MatRIC small research grants,

Content: Open, for proposers to define their own research and development actions within their own practice.

Message: Research is fundamental to innovation and development in teaching. It is necessary to understand what is happening in teaching and learning actions, the dissemination of knowledge through reporting is essential to take the field forward. Didactical research is within the grasp of all teachers and an essential part of regular practice.

Target group: Mathematics teachers in higher education.

Support for innovation and collaboration.

Content: Open, for teachers and students to define their own research and development actions within their own practice.

Message: Innovation in teaching, learning and assessment is at the heart of educational practice that seeks to achieve 'excellence'.

Target group: Colleagues and students within the University of Agder. The outcomes of the innovative practice to be reported at MatRIC and other events.

Summary comment

MatRIC sets out to involve mathematics teachers from other higher education institutions within Norway and to network these, with international experts in a community that is determined to work for excellence in teaching and learning mathematics. MatRIC aims to make participation accessible by covering accommodation costs and locating events around Norway. The most effective form of dissemination is personal contact. Further, communication needs to be a two-way process, MatRIC needs to listen and respond as well as announce and invite a response. MatRIC events and actions in the networks and opportunities such as the small research grants must be adjusted to align with the target groups. In 2017 MatRIC extended the dissemination effort by the appointment of 'envoys/ambassadors' who will visit other higher education institutions, both to take the message MatRIC wants to convey and bring back the information MatRIC needs to hear.