

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

## Action plan for a second phase of Centre funding 2019-2023 (*Draft*)

### 1. Introduction

This action plan is the outcome of meetings involving a comprehensive range of stakeholder representatives at institutional, national and international levels. Discussions have focused on the challenges and suggestions articulated in the “SFU Interim Evaluation, Report following site visit.” The plan builds on MatRIC’s achievements gained over the initial three and a half years of activity. This document sets out to communicate: clarity and purpose in MatRIC’s vision; focus and connectedness in MatRIC’s goals and strategy; security of leadership; and MatRIC’s strategic role within the University of Agder (UiA), the national and international educational contexts.

### 2. MatRIC’s Vision

Students’ experiences of learning mathematics are central in MatRIC’s vision. Figure 1 (ignoring for the moment the blue annotations) illustrates MatRIC’s focus. Performance in mathematics in higher education continues to be a cause of national concern. Securing durable improvements in educational provision is a multi-layered task including the teaching and the systems and contexts in which learning is intended. Thus, MatRIC has a role in challenging teachers and supporting change in teaching, curriculum implementations and structures. However, such change takes time, and in the present MatRIC is aware of the on-going needs of students, we therefore have a concurrent role to demonstrate how the difficulties students experience today can be ameliorated through learning support. This dual role, amelioration in the present and challenge to change for a better future is worked into a single coherent vision. MatRIC is a resource, a change agent, a competence broker, a provocateur for action, and a provider of evidence based knowledge.

MatRIC’s vision is therefore: *Students enjoying transformed and improved learning experiences of mathematics in higher education.*

The characterisation ‘*transformed and improved learning experiences*’ entails:

- Students as partners in teaching, learning and assessment.
- Research and development based (informed and enriched) education.
- Appropriate and timely learning support, and opportunities for constructive feedback about performance and the development of mathematical competencies.
- Teaching that ignites interest and enthusiasm for mathematics.
- Teaching that exposes the relevance and value of the mathematics learned in whatever discipline it is studied thereby motivating engagement in learning.
- Varied approaches to teaching, learning and assessment and accommodation to learners’ individual needs and learning styles.
- Effective use of technology and other resources for learning and teaching.
- Courses integrated within the programmes of study to which they contribute.
- Courses designed to accommodate variation amongst learners, such as the prior knowledge they bring to their studies.
- Structures that enable efficient and effective learning opportunities.

MatRIC is committed to working towards this vision within UiA with Norwegian mathematics teachers and higher education institutions, and with international partners.

### 3. Objectives and strategy

The blue annotations in Figure 1 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*.

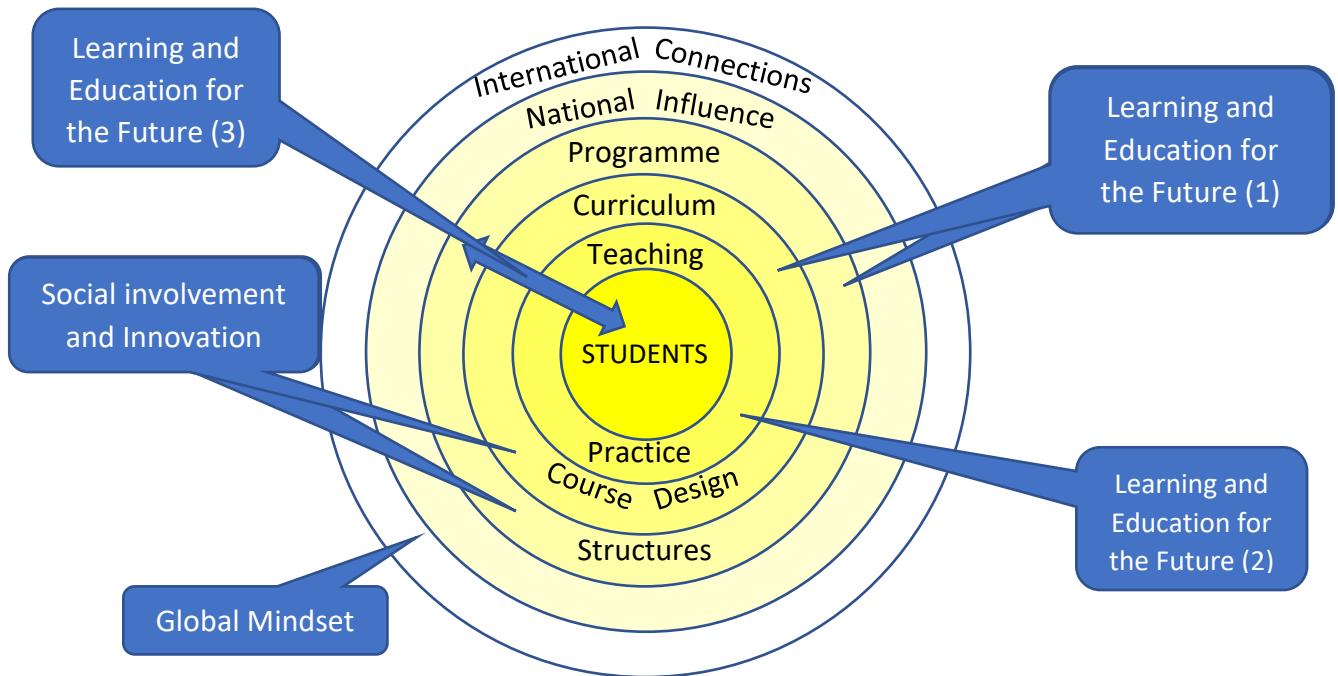


Figure 1. MatRIC's arenas of engagement and contribution to The University of Agder's Strategy.

Arenas of MatRIC's engagement	University of Agder's Strategy: focus areas
<ul style="list-style-type: none"> <li>a. Students</li> <li>b. Teaching practice</li> <li>c. Curriculum and course design</li> <li>d. Programme structures</li> <li>e. National Influence</li> <li>f. International Connections</li> </ul>	<ul style="list-style-type: none"> <li>Learning and Education for the Future</li> <li>1. Study programme &amp; quality management.</li> <li>2. Capacity building</li> <li>3. Centre for learning and teaching</li> <li>Social involvement and Innovation</li> <li>Global Mindset</li> </ul>

#### a. Students

Objectives: *Development of students as partners in teaching and learning; amelioration of the difficulties students experience when studying mathematics.*

Students occupy the central position in MatRIC's vision, goals and strategy. Whilst students should be the beneficiaries of MatRIC's actions, it is essential that they are also co-creators in the transformative improvements MatRIC develops, operationalises and promotes. MatRIC's objectives are to provide support to students that experience difficulty with mathematics, to encourage teachers to draw all students into partnership in teaching, learning and assessment, and to challenge the approaches, settings and arenas that give rise to many of the difficulties students experience. MatRIC's direct action in supporting students, through drop-in support, video and other digital resources, and teaching assistant development is additionally intended to provide examples of good practice and stimulate change in teaching approaches. MatRIC's direct action with students contributes to UiA's strategy for learning and education for the future as a prototype for a university centre for learning and teaching.

## **b. Teaching practices**

Objectives: *Share best<sup>1</sup> teaching practice; transform teaching; develop teaching competencies; research and development based teaching; students as partners in teaching, learning and assessment; MatRIC is the Norwegian ‘competence exchange’ for mathematics education.*

Transformation and improvement of teaching practices have driven MatRIC’s actions through phase 1, and will continue to be at the core of MatRIC’s objectives for phase 2. Substantive and comprehensive changes in students’ learning experiences will occur because teachers reflect critically on their practice and introduce innovations designed to address the difficulties students experience. Building on the community of practice in mathematics education that MatRIC has energised in phase 1, MatRIC’s will facilitate further exchange of experience, expertise and good practice between mathematics teachers within Norwegian HEIs, and connect these with international exemplars of best practice in teaching and learning mathematics. Specific objectives in the development of practice are the inclusion of research and development within regular teaching, and the comprehensive inclusion of students as partners in the educational process. MatRIC will be part of UiA’s strategy by contributing to the establishing of a process for the accreditation of teaching quality. MatRIC will support with competence, experience and resources the teachers seeking recognition for teaching quality.

## **c. Curriculum and course design**

Objectives: *Promote curriculum implementations and course designs that foster best practices; promote work-place experience for students and social involvement.*

Good curriculum and course design can create opportunities for excellent teaching but poor design can stifle excellence. MatRIC will be active in this arena of mathematics education development. However, MatRIC does not own courses and programmes, and so our focus will be on championing thoughtful design, providing support and brokering competence and expertise as required. MatRIC’s engagement with the broad HE mathematics community gives MatRIC exposure to examples of excellence that will be used to challenge teachers and course leaders to review their own implementation of curricula. MatRIC will champion student partnership at this level, through example, though funding student internships that will benefit teachers and teaching, and through demonstrating the rich opportunities for teaching and learning when students become partners in the educational process. For example, the recently approved Norwegian national framework for the mathematical education of engineers requires a greater variety of teaching and learning approaches than we believe to be experienced by most students in Norway. MatRIC has an important role to play, in promoting greater variety in teaching and learning, and through MatRIC networks, pointing to experience and competence that can be shared. Another example, the current national networks (not MatRIC’s) for teacher education can benefit from a stronger input from university mathematicians; MatRIC can broker this competence exchange. Within UiA, MatRIC will continue to be involved in discussions relating to the inclusion of mathematics within professional and STEM education. MatRIC will also continue to develop students’ industry based projects within mathematics courses.

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<sup>1</sup> The notion of ‘best practice’ is ambiguous. It could be taken as ‘best possible’, this is an ‘unknown’. The alternative sense, as it is used here, is ‘exemplar of best of current practices’, including the drive for continuous improvement.

#### **d. Programme structures**

Objectives: *Promote programme structures that facilitate educational effectiveness and enable high performance; facilitate the sharing of excellent practices in programme design and implementation.*

The objective is to achieve smaller classes, with mathematics effectively integrated within programmes of study, taught by mathematics specialists, with applications of mathematics to the user programme. This requires partnership between mathematics teachers and academics from the ‘host’ discipline. Smaller class sizes improve teacher accessibility, enable better, faster assessment feedback and better opportunities to tailor courses to individual student’s needs. However, it is also recognised that there are very strong economic arguments in addition to deeply embedded cultural mathematical practices seeking to preserve the status quo. MatRIC’s view will be promoted by sharing examples of better practice in which the improved quality of student performance outweighs the economic argument and reinforces the educational argument. In meetings leading to this action plan the idea of ‘MatRIC White Papers’ to stimulate discussion and debate was mooted. This idea will be pursued in phase 2.

#### **e. National Influence**

Objectives: *Competence sharing, engagement, outreach; stimulate critical review of existing practices, and promote best practices; a national voice for, and recognition of, quality in HE mathematics education and mathematics in schools as it has an impact on HE.*

MatRIC’s influence lies in pointing to and celebrating excellent practices found throughout Norway and abroad. From the outset, MatRIC has been a competence broker facilitating the exchange of experience and best practices between HE mathematics teachers throughout Norway; MatRIC will continue in this role. MatRIC has also been a change agent, by using the experience and expertise that is accumulating within the MatRIC community to challenge the educational practices that interfere with high quality teaching and learning. The importance of this activity will increase during Phase 2. MatRIC Ambassadors will play an important part in this, alongside the introduction of a MatRIC ‘correspondent’ in every Norwegian HE institution where mathematics is taught. MatRIC will develop an accurate and comprehensive picture of HE mathematics education in Norway, to be the basis of articulating a national challenge. A new post of Co-Director (see Section 5 Leadership below) will play an important part in influencing national policies and practices, a key responsibility will be the development and implementation of a new communications strategy that raises MatRIC’s profile.

#### **f. International Connections**

Objectives: *Networking with international centres of excellence in HE mathematics education; sharing experience of innovation in teaching and learning; dissemination of research based evidence of effects of teaching, learning and assessment approaches in HE mathematics.*

In Phase 1, MatRIC has developed strong international links which have provided a flow of knowledge, experience, innovation, and best practice into Norway. In Phase 2, the two-way flow will increase as more Norwegian HE mathematics teachers develop competencies and improved practices which they share internationally. MatRIC’s group of researchers, Post doc., PhD fellows, and master students will also contribute to the international community through presentation at conferences and publication in peer-reviewed scientific journals. It is clear from Phase 1 that MatRIC exemplifies the ‘Global Mindset’ of UiA’s strategy.

**Systematic inquiry in each of the foregoing ‘arenas of engagement’.** MatRIC will continue to support and promote research, development and implementation projects that will contribute to local, national and international knowledge of excellent practice.

#### 4. Goals (*numbers are best guesses at this stage*)

Goal (achieved by 31.12.2023)	Objective	UiA Strategy
‘100+’ Students participated in MatRIC student assistantship training	Students as partners in teaching, learning and educational innovation.	
‘20+’ Student summer internships		
‘15’ Student development projects supported		
Increasing student visits to Drop-in centres	Amelioration of the difficulties students experience when studying mathematics	Learning and Education for the Future - Centre for learning and teaching
Increasing viewings of MatRIC TV		
200+ p.a. students who engage in how to study mathematics courses		
‘90%’ Students self-reported satisfaction with their mathematical education.	Evaluation of impact of MatRIC’s actions to support teaching and learning	Learning and Education for the Future - Study programme & quality management.
‘25+’ Teachers supported by MatRIC in UiA’s teaching quality scheme	Transforming and improving teaching	Learning and Education for the Future - Capacity building
‘30’ Teachers participated in MatRIC’s teaching courses		
‘50’ Teachers in receipt of MatRIC’s focused small research, development and implementation grants		
‘150’ Teachers participating in MatRIC events		
‘15’ Network events promoting variation in teaching and learning, innovation and use of digital resources.	Promote curriculum implementations and course designs	
‘15’ Workplace focused projects for mathematical modelling projects	Promote work-place experience.	Social involvement and Innovation – Student practice.
‘5’ Programme networks publishing discussion papers and articles to challenge and communicate about best practices for mathematics education within programmes.	Promote programme structures. Share best practices in programme design and implementation	
‘50’ MatRIC Ambassador visits	National outreach: competence broker.	
Survey of Norwegian HEI websites to explore teaching and assessment approaches in mathematics	Support national engagement and outreach.	

MatRIC contact established in every STEM faculty in Norway	Communicate best practices	
Presentation of MatRIC's position on mathematics education in higher education	National outreach to communicate best practices.	
'100' Research reports in national and international conferences	National outreach to communicate best practices  International networking	Global Mindset
'40' Papers on university level mathematics education in scientific journals		
'25' PhD dissertations reporting university level mathematics education defended		
'12+' National and international conferences hosted by MatRIC		

## 5. Leadership

Changes to MatRIC's Management Board are proposed, to take effect as soon as agreement is given by the Board. The intention is to include a wider representation from UiA as host institution. Changes proposed are to extend student representation to include a member from UiA's Student Association, the Director of UiA's Educational Development and Learning Centre, and the Dean of Teacher Education. Proposals to expand the International Advisory Board to include leaders of two major Norwegian stakeholder organisations will be implemented when the second phase of funding is announced.

Present Network Coordinators will collaborate and take on a more active operational role, with less dependence on MatRIC's Director. A Co-Director will be appointed to share responsibilities with the present Director and to provide greater management resilience. The appointee will bring complementary competencies with a key responsibility being the development and implementation of a new communications strategy. MatRIC coordinators aligned to educational programmes (economics, engineering, natural sciences, health science, etc) will be sought, from other HEIs as well as UiA.

## 6. Sustainability

MatRIC's vision for phase 2 will be sustained, first through the development of momentum of a critical mass of HE mathematics teachers who are networked and collaborating in innovation that leads to transformed teaching and learning. Changes that MatRIC has promoted and supported across Norway, particularly in terms of course and curriculum design, will have demonstrated their effectiveness in improving the student learning experience and thus will have become embedded in the fabric of mathematics learning in HE. MatRIC will seek to embed national events within the biennial MNT (STEM) conference organised by the Norwegian Association of Higher Education Institutions (UHR). Local actions in student support, teaching and learning development, and international networking will be sustained through the university's strategy. By the end of phase 2, MatRIC will have established its place within UiA and become so crucial to the on-going implementation of its strategy Learning and Education for the Future that UiA will ensure that MatRIC activity continues.