Centres for Excellence in Education

NOKUT's evaluations

bioCEED, CEMPE and MatRIC

Mid-term evaluation - Centre of Excellence in Higher Education

December 2017

NOKUT

Interim Evaluation of NOKUT Centres for Excellence in Education (SFU): bioCEED, CEMPE and MatRIC

Final Report and Recommendations of the Expert Panel

November 2017

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1. Executive summary

This report is based on the interim evaluation of the three NOKUT Centres for Excellence in Education (SFU) that were awarded in 2014: bioCEED, CEMPE and MatRIC. The SFU initiative is intended to stimulate the development of effective and innovative educational practices in Norwegian higher education at undergraduate and masters' levels. SFU status is initially awarded for five years (Phase 1), with the possibility of an extension for another five years (Phase 2), subject to an interim evaluation.

The overarching aims of the interim evaluation were to support the Centres and the overall SFU initiative in reaching their goals and to enhance their contribution to the quality of teaching and learning in higher education. The evaluation panel was made up of international experts in both the subject areas of the Centres and university teaching, as well as a Norwegian student representative and a Norwegian higher education expert. The interim evaluation involved an assessment of the Centre's Phase 1 self-evaluation reports, visits to each of the Centres, and the assessment of the Centres' Phase 2 action plans. The panel provided feedback to the Centres at each stage of the evaluation.

Overall, the panel were impressed with all three of the Centres and **recommend** that each Centre is funded in Phase 2. In the full report, the progress of Centres, as well as the challenges they faced, in Phase 1 are discussed. Their plans for Phase 2 are assessed and areas for development are identified

In examining cross-cutting themes, the Centres had developed successful programmes of activity and clearer visions of their contribution to developing educational practices. The Centres would benefit from further developing their strategic approaches to their work, including more integrated ways of generating evidence about their impact on educational practices and more explicit models for disseminating their practices.

The interim evaluation identified six lessons for the SFU initiative as a whole. The need to:

- develop a more explicit theory of change;
- be more explicit about the changing expectations of Centres in the different funding periods;
- support the Centres in moving beyond their institutions;

- develop a more active view of students as partners within the initiative;
- support the development of educational leaders within the Centres; and
- recognise the key role that NOKUT has played in the success of the SFU initiative.

2. Overview and outline of process

This report is based on the interim evaluation of three NOKUT Centres for Excellence in Education (SFU) that were awarded in 2014, which ran from January to December 2017.

2.1 The SFU initiative

In 2010, the Norwegian Ministry of Education and Research took the initiative to establish 'Centres for Excellence in Education (SFU)' aiming to stimulate teaching excellence and educational innovation in higher education. The SFU initiative, which is a parallel initiative to the Norwegian Centres of Excellence in Research, is managed by NOKUT (the Norwegian Agency for Quality Assurance in Education), which is an independent expert body under the Ministry of Education and Research.

The SFU initiative is intended to stimulate the development of education and innovative approaches in higher education at the bachelor and master degree levels. The ambition of the initiative is to contribute to the development of excellent quality in higher education and to highlight the fact that education and research are equally important activities for all Norwegian higher education institutions.

SFU status is initially awarded for five years, with the possibility of an extension for another five years, subject to an interim evaluation after three to four years. An SFU is integrated into a higher education institution. Host institutions may be universities, specialised universities or university colleges. The host institution is the applicant for the appropriation of funds and the award of SFU status. In addition, an SFU consortium may include other HE institutions as well as organizations. The expectation is that the host institution and any consortium partners will specify a substantial contribution to the co-funding of the Centres.

There are currently eight Centres for Excellence in Education:

- bioCEED – Centre of Excellence in Biology Education
- CCSE – Centre for Computing in Science Education
- CEFIMA – Centre of Excellence in Film and Interactive Media Arts
- CEMPE – Centre of Excellence in Music Performance Education
- ENgage – Centre for Engaged Education through Entrepreneurship

- ExcITEd – Centre for Excellent IT Education
- MatRIC – Centre for Research, Innovation and Coordination of Mathematics Teaching
- ProTed – Centre for Professional Learning in Teacher Education

2.2 The interim evaluation

The interim evaluation was focused on three SFU Centres: bioCEED, CEMPE and MatRIC. They were successfully awarded Centre status in 2014 for the period 2014-2018. The three Centres were each awarded funding of 3 million NOK per annum in 2013. In 2015 the Ministry increased their annual funding to 4 million NOK (approx. €0.5 million) for the three remaining years of the current Centre funding period.

The overarching aim of the interim evaluation was developmental. It was intended to support both the Centres and the overall SFU initiative in reaching their goals and to enhance their contribution to the quality of teaching and learning in higher education nationally and internationally. Specifically, the aims of the interim evaluation were to:

1. Assess the impact and innovations of each Centre at institutional, national and international level, within their subject discipline and across subjects.
2. Support the Centres in developing action plans for the second phase of funding.
3. Make a recommendation to the NOKUT board on whether each Centre should be funded for an additional five-year period.
4. Provide feedback to both the individual Centres and NOKUT on the working of the Centres and the overall SFU initiative.

2.2 The expert panel

The expert panel was made up of the following members:

- Professor Paul Ashwin, Lancaster University (United Kingdom), Chair
- Professor Celia Duffy, Royal Conservatoire of Scotland (United Kingdom)
- Professor Andreas Eichler, University of Kassel (Germany)
- Professor Peter Maassen, University of Oslo (Norway)
- Professor Stephanie Marshall, Higher Education Academy (United Kingdom)
- Trine Oftedal, Norwegian Union of students (NSO, Norway), Student
- Professor Richard Reece, University of Manchester (United Kingdom)

2.3 The interim evaluation process

The interim evaluation of the three Centres for Excellence in Education involved the following stages:

1. Initial guidance from the expert panel to the Centres on the production of an initial self-evaluation report.
2. Each Centre produced a Phase 1 self-evaluation report.
3. Written feedback from the expert panel on these self-evaluation reports, which included requests for further information and an outline of the focus for the site visit.
4. A one-day site visit to each of the Centres.
5. A report from the expert panel on each of the site visits, which indicated areas for each of the Centres to consider in the production of their action plan for Phase 2 of SFU funding.
6. The production of draft action plans from each of the Centres.
7. The provision of feedback on these action plans by the expert panel.
8. The production of the final action plan by each Centre.
9. The evaluation of these action plans and the overall performance of each Centre by the expert panel.

It should be clear from this outline that the interim evaluation process was a discursive and developmentally-focused evaluation of the Centres. The expert panel were demanding in terms of the sense of vision and supporting evidence that they expected from the Centres, but were also active in supporting the Centres in how best to develop their visions and evidence.

3. bioCEED

3.1 Overview

The panel is grateful to the staff within the bioCEED group for putting significant amounts of thought and effort into the Phase 1 evaluation process and the construction of the action plan for Phase 2 of NOKUT funding. First and foremost, the panel wishes to congratulate the bioCEED staff for all that they have achieved during Phase 1. In short, they have created an exceptionally strong community of practice in the area of biology teaching. This community brings together educators, innovators and communicators to not only pass on best practice, but to stimulate original thinking in the area of biology teaching. In addition, they have promoted and overseen a large number of successful and innovative projects that focus on improving the student experience and aspects of the biology curriculum.

The panel also commends the leadership roles taken by bioCEED staff within their host institutions. This is likely to ensure the longer-term sustainability of the work they have undertaken and will enable the 'mainstreaming' of the activities they describe in the action plan. Taken together, the work completed during the first phase of NOKUT funding provides a firm foundation on which to build the next stage of development.

3.2 Review of Phase 1

3.2.1 Progress on stated aims in Phase 1

In Phase 1, bioCEED made excellent progress on its four main areas of focus:

- *Teacher culture*. There was a clear sense that the Centre helped to develop a scholarly approach to teaching and that students had experienced the benefits of the changes related to this approach. Teaching staff provided persuasive accounts of how the teaching retreats had helped them to develop evidence-informed approaches to teaching. The Centre played a pivotal role in the development of a teaching reward system at the University of Bergen, and was often used as an exemplar of good practice.

- *Innovative teaching*. In Phase 1, the Centre provided excellent support to those at Bergen and Svalbard, which led to a greater variety of teaching approaches being developed. The development of the bioSKILLS platform has a lot of potential to support innovative teaching on a national and international scale. The students and the stakeholders were full of praise for the intern scheme and the ways in which it provided productive links between the students, external stakeholders and wider society.

- *Practical training*. In Phase 1, bioCEED supported the development of work practice courses and a new dissemination project course. Students reported finding these courses very useful. Whilst these were elective courses, they had the potential to be accessed by a greater number of students. The bioSKILLS platform again has the potential to support the Centre's work in this area.

- *Outreach*. In Phase 1, bioCEED had a large impact on its host institutions and became visible in higher education discussions across Norway. For example, its work was highlighted in the recent Higher Education White Paper. The development of the National Forum for Educational Leadership in Biology with Biofagrådet has the potential to further extend the work of the Centre across Norwegian universities.

3.2.2 Challenges to progress in Phase 1

In Phase 1, the main challenges for the Centre were to move from working with those who were interested in developing their teaching within their home institutions to supporting sustained change to teaching practices on a wider scale. The panel recognised that this move was only possible because of bioCEED's very high quality work and that such a move would be challenging and difficult. The panel's comments should be read as suggestions for how to meet this challenge rather than criticism of the Centre's Phase 1 work.

The panel felt that there were a number of aspects to widening the scope of bioCEED. First, they felt that the Centre would benefit from a clearer articulation of its vision of biology education in Phase 2. This should set out the Centre's sense of how biology education and biology graduates contribute to wider society. The panel wondered whether the bioCEED's

triangle had led them to focus overly on the relations between content knowledge, societal relevance, and practical skills rather than exploring, in more detail, what their vision is for each of these aspects of their work. Part of this vision could, for instance, include the role of students in developing the curriculum, which seems under-developed in the Centre's work to date.

Second, the panel felt that there was a need to scale-up the work of the Centre in Phase 2 so that its positive impact was experienced by more students and teachers. For example, the internships were clearly of enormous value to the students, but the numbers of students who could take advantage of these was limited. Similarly whilst bioCEED had a significant impact on teaching cultures across its host institutions, its impact on teaching cultures across Biology Education in Norway appeared to be more modest. This raised the question of how the Centre might become a Centre **for** Excellence across biology in Norway as well as a Centre **of** Excellence. The panel's view was that this would require a shift to more strategic development of biology education in Phase 2 rather than focusing mainly on the development of exemplar projects.

Third, in developing this strategic approach in Phase 2, the panel felt that bioCEED would benefit from developing more specific overall objectives for the work of the Centre and an explicit account of how their progress against these strategic objectives will be evaluated. In Phase 1, the Centre had four areas of focus but did not articulate a way of measuring the the success of its overall contribution to Biology Education in Norway.

3.3 Assessment of bioCEED's action plan for Phase 2

bioCEED's Phase 2 action plan responded thoughtfully to the panel's feedback on Phase 1. The panel is keen to convey its strong support for the mainstreaming activities outlined in the Phase 2 action plan. The passion of the bioCEED team to both improve teaching of the subject, and instil teaching excellence in practitioners was clear. As described previously, the ability to influence the 'coalition of the willing' is likely to be distinct from the activities that will need to be undertaken for a broader audience. In Phase 2, the panel is keen to see bioCEED step-up to greater strategic, and therefore impactful, leadership.

3.3.1 bioCEED's Vision

The bioCEED vision for Phase 2 is to enable a culture to exist where innovations and innovators can flourish and the success (outcomes and impact) of these can be assessed. The panel supports this, and many of the stated actions will enable this to occur. However, the panel felt that the vision is still not wide enough. bioCEED has the potential to impact on the whole of biology education in Norway, natural science education in general, and beyond this to other disciplinary areas. The panel would like to see bioCEED take steps to enable, at least some of, this potential to be realised.

3.3.2 Teacher culture and educational leadership

The panel agrees that one of the major successes of Phase I for bioCEED was the development of a collegial teacher culture in the subject area. Now, it is proposed that they will work with the Pedagogic Academy to develop teaching in the subject and instil and disseminate teaching excellence. The notion of strong educational leadership programmes is mentioned (which the panel fully supports) but little is given in the way of detail.

3.3.3 Innovative teaching

A key aspect of the mainstreaming goals of the Centre is to integrate the innovative practices already developed by bioCEED (and those that will come in the future) into the broader curriculum. The panel was delighted to see that it is intended to develop programme-wide Individual Learning Objectives (ILOs) for both subject-specific and transferable skills (A12 of the action plan). This has the potential to be a subject 'game-changer' and, if woven into the work of the Pedagogic Academy and NOKUT, is likely to result in lasting changes in the teaching of biology across Norway. The panel looks forward to seeing the development of the 'holistic framework' over the course of the next few years.

The panel was somewhat disappointed in the approaches being suggested for evaluation of the impact of innovative teaching methods. This predominately seemed to involve recruiting PhD students to work on defined projects. While this may be appropriate, the Centre will need to think about supporting teaching staff to develop approaches to evaluating their teaching. Embedding reflective practice in teachers' approaches will be an important aspect of this.

3.3.4 Practical training

Biology is an inherently experimental discipline, and the panel recognises that students benefit greatly from 'real-world' practical and research experiences. The panel was therefore pleased to see that practice courses will be a compulsory part of the BSc programme (A21) and that other experimental/practical/practice will be developed. The assessment of the impact of this work does, however, need to be considered in greater detail.

3.4 Future development

In summary, the panel was very impressed with bioCEED's achievements in Phase 1 and pleased with the bioCEED action plan for Phase 2. The panel has great confidence in the ability of the Centre to deliver on its stated goals. In Phase 2, the mainstreaming activities will ensure a high degree of sustainability for the work that has been undertaken under the auspices of the Centre, and recognised that working with the Pedagogic Academy will influence the biology education community of practice across the sector.

The panel did, however, recommend a few areas that the Centre may wish to consider in further detail in Phase 2. The panel:

- would like to see more explicit mention of student engagement within the action plan. For example, this might include using students as partners in the development of the curriculum and as co-creators of content.
- is keen that bioCEED fosters deeper interactions with the Pedagogic Academy. This will be important to ensure that the work of the Centre has the widest possible reach.
- would like bioCEED to consider mechanisms by which teaching staff can be supported to engage in evidence-based reflective practice. This will enable more straightforward evaluation of the impact of projects.
- is keen to encourage a 'step-up' to strategic leadership for the next phase of the SFU. In short, the panel would like to see bioCEED taking a greater role in leading the sector, both in Norway and beyond.

3.5 Recommendations

The panel recommends to NOKUT that Phase 2 funding for bioCEED be given without condition. The panel does recommend that the four points listed in section 3.4 are taken into consideration when bioCEED plans its future work. Finally, the panel looks forward to both seeing how bioCEED develops in the coming years and working with the Centre to enable it to reach its maximum potential.

4. CEMPE

4.1 Overview

The panel is very pleased to note how CEMPE has engaged in such a positive and constructive manner with the panel's questions, feedback and critique. Overall, the panel were impressed with CEMPE's achievements in Phase 1. The action plan for Phase 2 builds on the strong foundations and achievements of Phase 1 and is likely to result in positive change for student learning and in CEMPE taking a role as a leading international player in innovation in higher music education. The panel has feedback, outlined below, on specifics of how projects are generated, evaluated and assessed as well as impact metrics, and on project management in Phase 2. These form the major recommendations in response to CEMPE's Phase 2 action plan.

4.2 Review of Phase 1

4.2.1 Progress on stated aims in Phase 1

In Phase 1, CEMPE aimed to support the advancement of teaching and learning in music performance by encouraging the use of both individual and group-based teaching and learning activities. It sought to use individual and group experiences and the sharing of experiences across genres to enhance students' instrumental practices. Finally, it focused on preparing students for successful engagement in a rapidly changing globalised music society.

The panel found strong evidence of progress in meeting these aims in Phase 1. The Centre had clearly been successful in shifting culture, breaking down barriers between teaching staff in different genres and supporting these staff to question their teaching practices. The Centre's bottom-up strategy for project development had begun to 'de-privatise' music education and had created a sense of shared endeavour. Students were very keen to engage in the work of the centre and could see strong benefits from being involved. Stakeholders were very positive about the potential of the Centre to support students' engagement with a globalised music society and in establishing partnerships with organisations beyond the academy. The panel felt that the development of the AEC

platform was an exciting initiative that could play an important role in the future development of the Centre.

4.2.2 Challenges to progress in Phase 1

The panel identified a number of challenges that CEMPE faced in its work in Phase 1. First, the panel felt that CEMPE could develop a clearer vision for music performance education. What was the Centre's sense of what music performance education would look like if CEMPE was successful in its work? How would this be innovative and different from the current state of music performance education?

Second, the panel wondered whether the bottom-up model of project development in CEMPE was hindering the development of this vision. It was difficult to get a sense of the ways in which CEMPE as a whole was greater than the sum of its parts. As part of this vision the panel also felt that the Centre needed to develop an explicit model of change to inform their work. How did they expect their strategy and projects to lead to changes in music performance education and what mechanisms would they put in place to support this change on an institutional, national and international level? In addition, the panel felt that the Centre lacked sufficient project management capacity to be able to organise and implement all of its projects in a comprehensive and effective way.

Third, there was a need for the stronger use of evidence to evaluate the extent to which CEMPE had achieved its overall vision. This need for stronger evidence was also reflected in the individual projects, where there appeared to be limited use of evaluative strategies to assess the effectiveness of particular interventions. The development of the vision for music performance education and the related model of change needed to be explicitly linked to evaluative mechanisms that would allow the Centre to have a clear sense of how successful it was being in realising its vision and supporting change.

Fourth and related to this, the panel were unclear about the relationship between CEMPE and the Norwegian Academy of Music. At times it felt like they were one and the same. Whilst one of the teachers we met described CEMPE as "turbo-charging the change process", the panel wondered whether there needed to be a clearer sense of the work that

CEMPE was committed to beyond the Academy. Clarity on the role of the AEC Platform would also be helpful here.

Fifth, the students we met were very keen to be involved in the work of the Centre. However, they indicated that they did not feel there were clear mechanisms that allowed them to participate in the work of the Centre. They also felt that the Centre's projects and initiatives tended to be evaluated from the perspective of teaching staff rather than from the perspective of students.

Finally, the stakeholders we spoke to were very complementary about the Centre's reputation. However, they also felt that they could be more involved in the work of the Centre. They felt that the Centre could have closer relationships with schools and the professional field of music and that this would be a useful focus within the second phase of the Centre.

4.3 Assessment of CEMPE's action plan for Phase 2

CEMPE's action plan for Phase 2 responds well to the challenges the panel identified in Phase 1.

4.3.1 The revised vision and objectives

The panel endorses the revised vision for CEMPE in which the key concept is that of collaboration: between students, teachers and researchers; different forms of knowledge (experience-based knowledge and research-based knowledge); between different musical disciplines; and between national and international partners. The panel also supports the revisions of the original three objectives and the addition of the fourth objective which addresses coherence and integration between different areas of music study. This is an aspect of higher music education that is universally the subject of negative feedback from students and is worthy of systematic scrutiny and interrogation. The interweaving into all areas and objectives of a new thread, the use of technology and digital learning, is convincing and well-argued. In summary, the panel finds the overall vision and objectives coherent and properly supported by appropriate actions.

4.3.2 Actions

The actions listed under each objective are appropriate. As noted above, the panel strongly supports the integration of technology and digital approaches into each objective. It applauds the focus on students – as both partners and initiators of projects. The actions on the area of practising (where technology may be particularly useful), the separation of 'practising to learn' and 'practising to perform' and the ambition to create a practising curriculum are strong, and demonstrate an ideal combination of research- and practice-led investigation. The panel's questions about the relationship with the AEC Platform and the relevance of artistic research are argued and answered convincingly.

4.3.3 Project generation, assessment and evaluation, and impact measurement

The plan presented by CEMPE argues for a flexible approach to project generation ("Experiences from the first period have shown that well-founded ideas for new projects occur all the time. Therefore, we do not want to lock the plan into a set of predefined, detailed projects.") The panel has some sympathy for this approach, particularly as the actions for each objective are appropriate and specific in terms of *how* they will explore the objectives, even if they do not specify exactly *what* will be done. The panel, therefore, accepts the argument from CEMPE that being 'locked in' to projects would be counter-productive at this stage, but recommends that the detailed stage of activity planning needs to be robust. The panel notes the new arrangements for project management (see below).

The plan also argues for an individual project-by-project approach to assessment and evaluation ("Another premise for this plan is that each project *must* determine which approaches and tools that should be used in that particular case.") Again, the approach is flexible and developmental ("Including students as assessment partners implies that they will be part of the whole project development process by formulating project questions together with faculty, deciding what is to be evaluated, and how.") The panel notes this flexible, project-by-project approach, but with some caution, as it may compromise both the overall sense of purpose and coherence and be cumbersome to manage. The inclusion of students as assessment partners is a great indicator of the Centre's vision for students as partners, which the panel applauds.

The plan outlines a spectrum of areas of impact. In the panel's view, impact assessment still relies rather heavily on surveys and urges CEMPE to consider reflective practice for all participants (students, teachers, researchers) as a crucial tool for evaluation. The panel would like CEMPE to build in reflective practice to projects so that it may become a more prominent and potentially rich source of data.

4.3.4 Centre organisation and project management

In the panel's view the increased capacity, including a deputy director, takes proper account of the complexities of both CEMPE and AEC activities and their interactions. The panel is confident that the levels of governance and scrutiny are appropriate and robust, and that the roles and responsibilities of each are clearly delineated. The panel is pleased to note the inclusion of students at all levels and the very strong institutional support for CEMPE.

Given the flexible and individualised structure proposed for projects above, the need for robust project management and control is highlighted. The plan notes the expectations for qualified project managers and reporting structures; the panel recommends that project management is very closely and frequently scrutinised to ensure its effectiveness.

4.4 Future Development

In summary, the panel were impressed with CEMPE's achievements in Phase 1. The panel feels that CEMPE's Phase 2 action plan responds well to the challenges that were identified in Phase 1 and has confidence in the ability of the centre to deliver on its objectives. As noted above, the plan for a second phase of centre funding builds on the strong foundations and achievements of the first phase and is likely to result in further positive change for student learning and in CEMPE taking a role as a leading international player in innovation in higher music education.

The panel, however, has reservations in two areas that it recommends CEMPE to consider in further detail. These are:

- Given the flexible and individualised structure proposed for projects, the need for strong project management and control is highlighted. The plan notes the

expectations for qualified project managers and reporting structures; the panel recommends that project management is very closely and frequently scrutinised to ensure its effectiveness.

- In the panel's view, impact assessment still relies rather heavily on surveys and it recommends that CEMPE should consider reflective practice for all participants (students, teachers, researchers) as a crucial tool for evaluation.

4.5 Recommendation (including any recommended conditions)

The panel recommends to NOKUT that Phase 2 funding for CEMPE be given without condition. The panel does recommend that the two points outlined in section 4.3 are taken into consideration when CEMPE makes its detailed plans. The panel congratulates CEMPE on its work so far and looks forward to innovative and impactful future developments.

5. MatRIC

5.1 Overview

The panel greatly appreciates the open and constructive way in which MatRIC has interacted throughout the whole interim evaluation with the panel, including its positive responses to the panel's questions, comments and feedback. This has resulted in an overall convincing and appropriate action plan for Phase 2 of Centre funding, which can be expected to have a positive impact on student learning outcomes in mathematics education not only at the University of Agder (UiA), but throughout the whole of Norwegian higher education.

5.2 Review of Phase 1

5.2.1 Progress on stated aims in Phase 1

In Phase 1, MatRIC aimed to lead research and innovation in mathematics 'user programmes' by networking mathematics teachers, conducting research into innovation in the teaching and learning of mathematics, developing teaching resources that simulate workplace applications of mathematics and support mathematical modelling and disseminating research and innovation in mathematics teaching. The panel recognised that this was very important work given that difficulties with mathematics are a significant cause of drop out in Norwegian undergraduate education.

The panel felt that the Centre had made good progress on a number of these aims in Phase 1. The Centre had set up good national networks of mathematics teachers and had conducted some useful research into the teaching and learning of mathematics. The students and teaching staff, as well as the national stakeholders, that the panel talked to were very positive about the work of the Centre and clearly felt it had supported their engagement with mathematics education. Students were positive about the innovations, such as the flipped classroom, that the Centre had supported. The Centre had developed a number of useful resources including those on MatRIC TV and had made good progress in disseminating their work. The international networks of the Centre were also impressive and this was underlined by the participation of a number of the international partners in the site visit.

The panel were also impressed by the level of institutional support for MatRIC by the senior leadership of the University of Agder. The senior leadership clearly stated that the Centre will play an important role in future institutional development of teaching and learning and were very committed to the future development of the Centre.

5.2.2 Challenges to progress in Phase 1

The panel identified five main challenges to progress for the centre in Phase 1. In setting out these challenges it is important to be clear that in trying to support mathematics as a service subject, MatRIC was working in a very challenging area. This means that it is not surprising that it faces many challenges in undertaking its work and the challenges outlined were highlighted to support MatRIC in developing its plans for Phase 2 rather than as criticisms of MatRIC's progress in the Phase 1.

First, the Centre's vision for mathematics education was not sufficiently clear. Part of the challenge of mathematics education appeared to be that it is taught separately from students' main subject or professional area. The panel members were not clear to what extent the Centre saw its Phase 1 work as challenging this separation or simply trying to ameliorate the problems that are caused by it. Using the terminology of one of the students the panel met, if the Centre is to turn mathematics from a 'no subject' to a 'yes subject' then students need to be able to see how it is relevant to their main subject of study. For Phase 2, the panel felt that the Centre needed to develop a clearer narrative of the kind of changes it wants to support, and how it wants to support such changes.

Second, the panel were not clear how the overall whole of MatRIC's work in Phase 1 was greater than the sum of its parts. This was because the panel were unsure about how the individual elements were mutually connected and contributed to MatRIC's overall strategy, and how this strategy was being applied in different disciplinary contexts. For example, the panel were not clear what strategic role MatRIC TV played in the work of the Centre. This was particularly as some of the videos produced seem to be based on traditional approaches to mathematics teaching and thus appeared to undermine the Centre's commitment to supporting innovative teaching practices. Similarly, it was not clear how the drop-in centre provided a sustainable model of development given that it was focused on supporting individual students to solve individual maths problems. To be clear, the

panel wished to see *how* these initiatives contributed to the overall strategy rather than suggesting that these initiatives did not contribute to the strategy.

Third, the panel felt that MatRIC's change strategy could be developed further in Phase 2. In Phase 1, the approach appeared to be to work with the enthusiasts and support them to be change agents. However, the panel were not clear how this would lead to systematic and sustained change given the institutional and disciplinary norms that often play a key role in reproducing traditional teaching practices. The panel also wondered whether this strategy would be more effective if it also focused on developing relationships with institutional partners as well as with individuals. Similarly, it was not clear how much the Centre was focused on supporting all mathematics education and how much it planned to work on a subject-by-subject basis. The panel heard how Engineering was a main focus of the first round of funding and that Economics was due to be a focus of the second phase of funding. The panel wondered whether a more systematic approach to supporting mathematics education might be more sustainable than working with each subject in turn.

Fourth, the panel felt that there was a lack of evidence provided to show how the Centre had met its overall aims in Phase 1. There was also a need to develop a more evidence-based approach to developing and evaluating initiatives in Phase 2. In developing a vision for mathematics education, the panel suggested that Centre should pay close attention to how it was going to evaluate its success in realising its vision.

Finally, the panel was concerned that the success of the Centre in Phase 1 was too dependent on the Centre Director. For Phase 2, the panel felt that it was important that a more distributed approach to leadership was developed and that the Director was supported by both the Centre and the University to develop and implement a clear strategic vision for the Centre. Related to this, whilst there was strong institutional support for the Centre in Phase 1, the panel were less clear about the role that MatRIC was expected to play in the University of Agder itself. For example, while MatRIC cooperated with BioCEED in a project aimed at strengthening mathematics education for biology students at the University of Bergen, it was unclear how mathematics education for biology students at the University of Agder benefited from this project. In Phase 2, the panel suggested that it would be helpful for MatRIC to develop a clear account of how it

enables the University to deliver key aspects of institutional strategy aimed at strengthening educational quality at the University.

5.3 Assessment of MatRIC's action plan for Phase 2

MatRIC's action plan for Phase 2 responds well to the challenges that it faced in Phase 1. It presents an adjusted and focused Centre vision and a well-structured, detailed set of actions and objectives. The panel is positive about MatRIC's more clearly elaborated role in the University of Agder (UiA) and the proposed changes in the leadership structure as presented in the action plan. The panel wants to stress that the former should not lead to a diminishing emphasis on the national role of MatRIC, but rather that a greater embedding of the Centre in UiA should be realized in addition to a further strengthening of the national role. When it comes to the proposed leadership development, the panel wants to make it clear that this is not regarded as necessary because of the ineffectiveness of the current leadership structure. On the contrary, the panel is highly appreciative of the important achievements of the Centre under the current leadership, but it feels that the proposed leadership change will allow the Centre to stretch itself strategically beyond its current achievements. For that purpose, the new leadership structure should allow for a clearer separation between strategic, academic leadership tasks and administrative management tasks.

While the panel's overall assessment of MatRIC's action plan is positive we still would like to suggest some areas where the Plan and MatRIC's actions can be further elaborated and strengthened.

5.3.1 Integrating actions strategically

MatRIC's action plan presents three primary, three secondary and two tertiary objectives, and a large set of actions directed at achieving these objectives. The level of detail in this is very impressive, but what is somewhat lacking is an indication of how the objectives and actions are strategically related. The panel hopes and expects that MatRIC will be able to deliver more than the sum of all parts in this. This implies that we strongly urge MatRIC to identify where and how the proposed actions can be connected if not integrated, what the intended (additional) outcomes of these integrated actions are, and which of the integrated actions are prioritized by the Centre. For example, how are the first 4 actions under 4.1 related to each other, and what is the intended joint outcome? In addition, how

are these 4 actions related to actions 4.1.5, and 4.1.6 and what are intended and expected joint effects of these 6 actions in student learning outcomes? Similar questions can be raised with respect to the other objectives and actions: where can connection or integration among actions be expected to produce outcomes that would not be possible to achieve if all actions would be implemented as separate and self-standing?

5.3.2 Putting 'smaller classes' more central in the Action Plan

In section 4.8 of the Action Plan a number of research-based arguments are presented with respect to the benefits of smaller classes combined with specific pedagogical practices for improving the quality of mathematics education. At the same time, it is argued that economic arguments and cultural practices stand in the way of introducing smaller classes in practice. However, the Panel is convinced that MatRIC could become more active in the promotion of smaller classes in mathematics education. This could, for example, be done by developing, together with UiA, a strategy for making smaller classes possible and affordable. Making smaller classes possible could also mean developing strategies that reduce the class size in regular lectures temporarily, for example, in the flipped classroom scenarios that MatRIC developed in Phase 1. Experiences from UiA could then be used to analyse the impact of smaller classes in mathematics education in more detail, and to use these analyses for promoting in a more structured way smaller classes (possibly combined with other actions, see point 1) among other universities and colleges in Norway and internationally. A connected question here is how much weight MatRIC wants to give to the impact of smaller classes on realizing better outcomes in mathematics education, and linked to this, how the impact of 'smaller classes' relates to the actions proposed under 4.1? Assuming that smaller classes, which allow for the use of beneficial pedagogical practices, will have a considerable impact on student learning outcomes, the Panel recommends that MatRIC reconsiders regarding smaller classes or regarding strategies to partly reduce class sizes in regular courses as a programme design issue, and integrates it in its core set of actions for transforming student learning experiences and outcomes.

5.3.3 National relationships

As argued in the Centre's self-evaluation report and testified during the panel's visit to the University of Agder, MatRIC has developed into an important national node for promoting excellence in mathematics education in Norway. The panel welcomes MatRIC's objective to further strengthen its national role by recruiting a coordinator for collaboration with

MatRIC at each higher education institution in Norway. In order to benefit more structurally from the resulting collaboration network, the panel recommends that MatRIC develops a more dynamic and effective collaboration schedule with these coordinators. This could, for example, include more regular meetings (online or face-to-face), more joint projects, more structured agreements on how to introduce MatRIC practices and outcomes of MatRIC actions in other Norwegian universities and colleges.

5.3.4 Realistic and effective ways of evaluating and measuring the impact of MatRIC's actions

The action plan of MatRIC proposes "student evaluation questionnaires" as an instrument to assess the outcome of different actions. Further, at some places it is mentioned that certain evaluation instruments, such as a large-scale study of the impact of actions on student learning and the systematic observation of teaching by MatRIC researchers, are desirable, but beyond the resources available for MatRIC.

While the panel understands that organizing large scale evaluation studies is beyond the SFU funding the panel recommends the Centre to consider alternative and easily usable instruments for evaluating the outcomes of the proposed actions. These instruments could be adopted or be slightly modified on the basis of existing instruments for measuring cognitive, affective or motivational aspects of students' learning. Further, since students are seen as partners in MatRIC's action plan, including students as partners in evaluating the outcome of specific actions could open alternatives to common student evaluations. In addition, the panel recommends considering the possibility to conduct easy realisable (quasi-)experiments with partners of other Norwegian higher education institutions where certain courses could serve as a treatment group if they adopt a MatRIC action or as a control group. Each of these student-driven and experimental evaluations could at the same time enlarge the visibility of the benefits of the Centre's work.

5.3.5 Connection between MatRIC's research activities and MatRIC's actions

The action plan includes different strategies for supporting the research of PhDs and a postdoc within the Centre. The panel is confident that these strategies will have a positive effect on the research referring to MatRIC's action plan. However, the panel recommends unfolding the connection of the research done or planned in MatRIC and the actions in the action plan for Phase 2. It is important, for example, to elaborate how MatRIC research is,

or will be, connected to the transformation of student learning. Further it could be worthwhile to clarify the role of pedagogical research or partners from a pedagogical support structure at the University of Agder within the research of MatRIC.

5.4 Future Development

The panel were impressed with MatRIC's achievements in Phase 1 and is confident that the Phase 2 action plan provides a solid basis for MatRIC to develop further as a national Centre for excellence in mathematics teaching and learning in higher education in Norway. As discussed above, the panel would like to see the Centre develop its work in the following areas:

- Work to develop greater integration between its strategic actions.
- Examining innovative ways of harnessing the potential of smaller classes in its work.
- Further developing its national relationships through the use of institutional co-ordinators.
- Further developing its approaches to evaluating and measuring the impact of its actions.
- Strengthening the integration of research activities in the work of the Centre.

5.5 Recommendation

The panel recommends to NOKUT that Phase 2 funding for MatRIC be given without condition. The panel does recommend that five points outlined in section 5.4 are taken into consideration when MatRIC plans its future work. The panel congratulates MatRIC on its achievements to date and is excited to see how its work develops in the future.

6. Cross cutting themes and lessons learned for the overall SFU initiative

6.1 Cross cutting themes from the interim evaluations of the Centres

6.1.1 Successes

Across the three Centres there were two common areas of success. First, all three of the Centres have developed a number of successful programmes, projects, and initiatives and had convincing evidence of the contribution these had made to teaching practices and the learning of students. Second, over the course of the interim evaluation, each of the Centres developed more convincing visions of where they saw their contribution in developing educational practices within their subject area.

6.1.2 Areas for development

Given that seeking to enhance the quality of teaching and learning in a systematic way is challenging and difficult, it is not surprising that there were also three areas where the panel felt that all of the Centres could develop their work further.

First, all of the Centres seemed to find it difficult to think strategically about how they planned to develop education. They all had established very impressive initiatives, but were less certain about how these initiatives came together to be greater than the sum of their parts. For example, all of the Centres appeared to find it challenging to bring together their work within their institutions, their work involving institutions across Norway, and their work internationally. The three Centres seemed to being working most effectively at two of these levels: bioCEED and CEMPE were more successful institutionally and internationally, whereas MatRIC was more successful nationally and internationally. However, none of the Centres had developed a strategy that brought together their work at these three levels into a coherent whole that captured the distinctive contribution that the Centre was making.

Second, all of the Centres faced challenges in managing aspects of their individual projects. In particular, there was a tendency to think about evidence in terms of formal research studies or PhD theses. There was less use of secondary data that was available from their

institutions or careful thinking about how to utilise the messy, partial data that was generated in their day-to-day practices. All of the Centres would benefit from spending time working out how they can generate evidence about their effectiveness as an integrated part of their day-to-day activities rather than as something that is separate from these activities. In doing so, they should focus on how to develop 'measures of success' rather than 'measures of activity'. This would involve developing these measures of success prior to undertaking their work and further refining them, in an iterative process, over time. This would provide stronger evidence of the impact of, and value added by, the Centre's work. At the moment, most of the evidence the Centres have is related to how many activities they have run rather than about the impact these activities have had on the practices and outcomes of teachers and students.

Third, all of the Centres would benefit from developing more explicit models for disseminating the innovative outcomes of their activities. Crucially, these should focus on how they expect their approach to dissemination to lead to changes in the educational practices of students, teachers and institutions locally, nationally and internationally both within and beyond their subject areas. Doing this would allow them to develop more targeted dissemination strategies, which are clearly informed by the kinds of changes they are seeking to support.

6.2 Lessons learned for SFU Initiative as a whole

The interim review panel identified six lessons that could be considered in the future development of the SFU initiative.

First, it is clear that the Initiative would benefit from having a more explicit theory of change that helps to inform its approach and decision making. This would involve developing a clearer sense of how the SFU is expected to lead to changes in educational practices in higher education in Norway and internationally. This would enable NOKUT to have a clearer sense of the success of the SFU initiative.

Second, as part of this, it would be helpful if a clearer sense could be developed of how Centres are expected to shift their strategic approach between Phase 1 and Phase 2. As outlined in Section 6.1, the panel were clear that they felt that a more strategic approach

was a critical element of the second phase. However, the individual Centres seemed not to share this view.

Third, as part of the theory of change, it would also be helpful if the SFU initiative found ways of supporting the Centres to move beyond their institutions in Norway. Two of the Centres had excellent institutional and international links but appeared to find it much harder to develop strategic cross-institutional links within Norway.

Fourth, the initiative as a whole would benefit from developing a view of students as active subjects within the SFU rather than as objects. Whilst all of the Centres have had impressive success in supporting students, there is still an underlying sense that things are done 'to' or 'for' students rather than 'in partnership with' students. In particular, students seem to have a very limited voice in helping to shape the strategic direction of the Centres.

Fifth, the previous points all highlight the challenge of developing educational leadership. This is a challenging area to work in but the long-term success of the SFU initiative will be shaped by its ability to support the development of educational leaders who have a clear strategic vision, which is inclusive of institutions across Norway and involves students as active partners. An integral part of this is the need to further develop project management capacity in the Centres of Excellence.

Finally, it is important to be clear that the challenges outlined above are not particular to the SFU initiative. They are faced by any national system that attempts to support the enhancement of university teaching. The panel were impressed with the success of the SFU initiative to date. This success is based on the excellent work of the Centres but it is also based on NOKUT's excellent relationship with the Centres. There was a strong sense of trust between NOKUT and the Centres, which seemed to be based on NOKUT's expertise in quality assurance and enhancement and their collegial approach to working with the Centres. Without this trust, it is unlikely that the initiative would have been nearly so effective.