

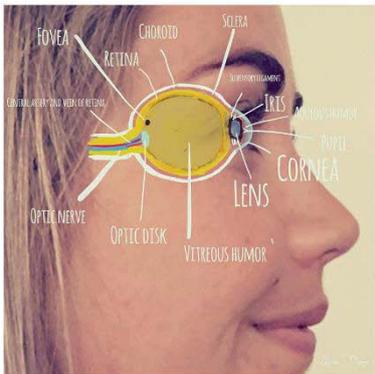


Centre for
Excellence in
Education



Interim evaluation – Centre for Excellence in Education (SFU) 2017:

bioCEED self-evaluation



I. THE GOALS THAT THE CENTRE PUT FORWARD IN ITS APPLICATION

The bioCEED vision

bioCEED is built on the vision that biology, and biologists, emerge in the interplay between biological theory, the practical applications of biological knowledge, and the relevance of biological theory and practical knowledge for society (Fig 1). Biologists can be found on both sides of the table in societal and ethical debates. Biology education must therefore prepare our students for difficult and demanding roles in tomorrow's science and society.

We believe that this 'biological triangle' should have implications; not only for *what* we teach, but also for *how* our students are trained. Towards this end, bioCEED will:

- 🌱 Make use of the whole biological triangle in biology education
- 🌱 Focus on the students, and what benefits their learning
- 🌱 Exploit the research culture to grow a collegial and scholarly culture of teaching and learning

bioCEED will enable **development and research-based assessment of learning practices** that strengthen the knowledge base, skills sets, and vocational integrity of tomorrow's biologists. We will significantly promote sharing of 'best practice' within the centre, across the educational sector, and with society.

The project plan consists of seven closely integrated strategic goals with corresponding work packages (Fig 2). bioCEED's activities in educational development, innovation, and research within these work packages are progressing according to the Centre Plan and Budget, with only minor deviations¹. We thus have high activity and have achieved progress towards all main strategic goals as laid out in the Centre plan. When needs for adjustments have arisen, specific actions have been adjusted or changed, and new actions have been added under some strategic areas.

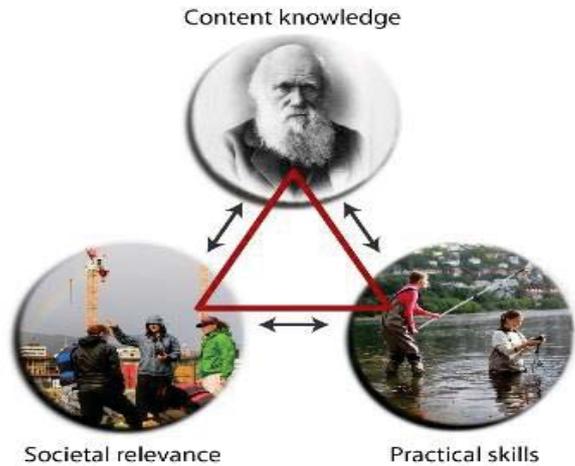


Fig 1. The 'domain of biology' as defined by the interplay between the scientific content knowledge of biology (theory, factual knowledge), the various skills and practices that are inherent parts biology itself, and society's applications of and needs for biological knowledge and skills.

bioCEED's aims and objectives

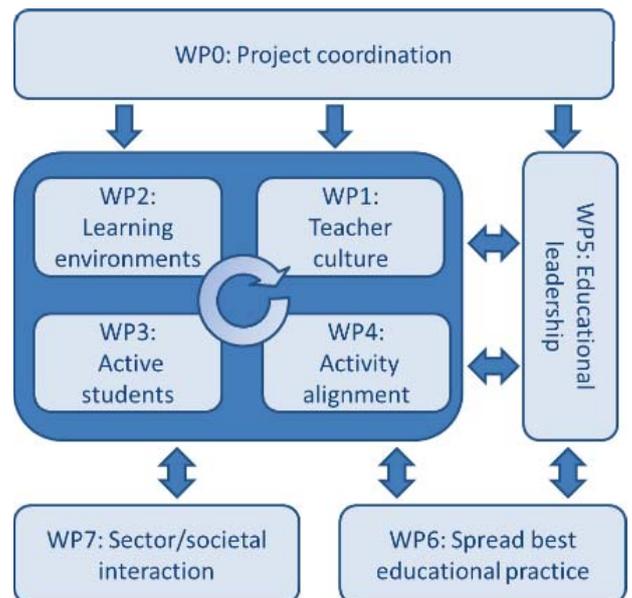


Fig 2. bioCEED is organized in eight work packages (WPs). These are linked to the centre's core strategies, and represent different important perspectives on educational quality and development. The dark blue central area represent key determinants of quality within education *per se*, whereas the outer WPs represent surrounding fields and processes that affect educational quality. From 2016 on the WPs have become more of a hidden underlying structure as we now communicate and brand bioCEED activities and outcomes under the four 'focus areas' **teacher culture, innovative teaching, practical training, and outreach** (see bioceed.no).

¹ See the timeline (Appendix 1), and bioCEEDs annual reports [2015](#) and [2016](#) for details

Such changes have mainly arisen due to:

- 📌 Appreciation of the need for collecting base-line data²
- 📌 New externally funded projects that enable increased activity under some strategic areas³
- 📌 New collaborations with educational developers and/or institutions in Norway and abroad⁴

From 2016 onwards the work-package organization has become more of a hidden underlying structure as we have repackaged the communication and branding of bioCEED projects, activities, and outcomes under four main focus areas; **teacher culture**, **innovative teaching**, **practical training**, and **outreach**. This was done in response to input from the Advisory Board, who challenged us to rethink our communication to focus on outputs, results and the interests of different user groups and collaborators, rather than on the ‘inner workings’ and organization of the Centre itself. Below we therefore report on our aims and objectives (question 1 in the self-assessment template), achievements (question 2), innovations (question 3) and challenges (question 4) under each of these main themes, after describing some crosscutting issues relating to these questions. We then proceed to address the final questions in part I of the self-assessment, about organization and management (question 5) and proposed change (question 6).

Cross-cutting issues vs. achievements, innovations, and challenges

For each of the four focus areas, bioCEED’s aims target one or more specific strategic goals. The role that bioCEED adopts vs. the staff, students, and other stakeholders vary significantly between focus areas. Under focus area 1, the development of a collegial **teacher culture** based on the Scholarship of Teaching and Learning, the Centre has filled a void both within the host institutions and nationally. Locally, we have taken a systematic approach to grow a quality culture through developing, offering, and motivating teachers to participate in new arenas and training opportunities for collegial educational development. At the time when bioCEED was established, the teachers were already mature and ready for change. The same can be said for focus area 3, **practical training**, where initiatives were welcomed by students, teachers, and end-users. bioCEED’s active role vs. these focus areas has also been reflected nationally, where we have been highly profiled in the media and in policy development both as participants in the current debates, and as a case study and example used by others. Our high profile vs. these topics is reflected in that they also dominate focus area 4, **outreach**. In contrast, in focus area 2, **innovative teaching**, our role and profile is more early-stage, and hence our activities are more local. Initiating projects for change and innovation in teaching has been primarily based on a ‘coalition of the willing’ approach, with bioCEED taking a largely inspirational and supportive role, seeking to enable and inspire the staff and initiate and follow-up projects.

Arguably, our most innovative contributions result from working across focus areas. For example, in developing novel digital learning tools⁵ and internship-based student practice opportunities⁶ we start from clear learning goals vs. biological skills acquisition, apply and develop evidence-based pedagogies, conduct educational research, and communicate effectively with the outside world.

Achievements

Innovations

² During our first year in operation, we developed and implemented the [bioCEED survey](#) of the views and experiences of >1000 biology student, staff, and employees across Norway on a range of issues regarding teaching, learning and working in biology

³ For example, the [PRIME](#) project researches how work-place practice during the BSc affect student learning

⁴ For example [iScope](#), Sammen for Bedre Læring with CEMPE, Math-BIO with SFU MatRIC (see page 13), [TraitTrain](#), etc.

⁵ See the species identification app [ArtsApp](#) and the learning platform [bioST@TS](#) etc.

⁶ For example, our new [work-place practice courses](#) where do [research](#) on innovative teaching and assessment using [student blogs](#)

Changing existing systems and traditions requires effort and time: changing collegial cultures and entire study programmes require greater effort and more time than inspiring individuals to change their individual practice. Obstacles include resistance, lacking or inadequate infrastructure, regulations, and traditions. As an extreme example, our Strategy 4, **“Aligned quality assurance, evaluation, goals and practice”** (see appendix 1) is all-encompassing and therefore highly demanding, as it builds on the successful completion and implementation of a number of more specific changes in teacher culture, course structure, teaching, student learning, institutional evaluation and assessment, infrastructure, and practices. This is not something that we expect to achieve short-term, but rather a goal for the entire SFU period. For some of our shorter-term goals, we are already transitioning specific actions from being ‘development projects’ to mainstreaming them within the everyday practice of our institutional structures and processes. This transition is a challenge to itself. Overall, we have had high impact on teaching and learning locally, whereas, to date, we have limited impact on these aspects nationally and internationally. In contrast, our profile vs. leadership and policy are high both locally, institutionally, and nationally, and we are also becoming visible internationally⁷.

Focus area 1: Teacher culture and educational leadership

At the core of bioCEED’s work is the realization that education, and development of educational quality, is a collegial responsibility and a collaborative activity. Furthermore, students and teachers are not the only ‘players’ in the educational ‘game’; technical and administrative staff, course assistants, educational developers, and the departmental and institutional leadership make up the partnership that together shape the content and quality of our courses and programs.

bioCEED has worked to promote a scholarly and collegial (SoTL) teacher culture by explaining and motivating the need for a cultural shift, and the benefits for education, educational quality, and individual teachers and students. The next step was creating arenas where different stakeholders, and especially the teaching staff, collaboratively can develop their pedagogical knowledge and skills and share and discuss teaching and learning⁸, with the Collegial Project Course as the flagship⁹.

Ensuring that the ongoing development of teaching practice also includes a strengthened focus on high-quality documentation and reflection around course content and pedagogy¹⁰. Our strategic partnership with LTH, Lund University¹¹, has been especially important for strengthening strategic educational leadership and organisational structures that support a scholarly teaching culture, and gives visibility and recognition to quality teaching, both locally, nationally, and internationally.

bioCEED work and ‘community approach’ to educational development have led to what we would describe as an ‘emerging SoTL-culture’ among the teaching staff at our two biology departments. This shift is expressed as a transformation in the teaching practice and communication about teaching, and

⁷ bioCEED is a case study in the report [How Can One Create a Culture for Quality Enhancement?](#) (Kottman et.al 2016) and we were mentioned eight times in the recent [white paper on educational quality](#) (Meld. St. 16 (2016-2017)) from the Department of Education. See also our Keynotes and conference paper presentations at international conferences in the 2015 and 2016 Annual Reports.

⁸ Such arenas now include annual [teachers’ retreats](#), seminar series, the annual Collegial Project Course, and various workshops.

⁹ The **Collegial Project Course**, arguably the flagship in our teacher culture work, takes the collegial SoTL culture work one step further, as it offers the teaching staff opportunities to work in groups of 3-5 to research, write reports, present at conferences and even publish on specific questions and topics of interest for developing a learner-focused teaching and learning within our course and programs. See the 2016 annual report for a description and course programme, and the [MNT conference proceedings](#) (Published as a special issue in the Nordic Journal of STEM Education) for examples of such projects and their outcomes.

¹⁰ This involves making constructive use of the quality assurance system: We should not just ‘tick the box’ in terms of having conducted the required steps, we should actually use the quality insurance systems constructively in our educations.

¹¹ Secured through appointing an adjunct associate professor, Roy Andresson, and a member in our Advisory Board, Anders Ahlberg

the attitudes towards teaching and learning and educational development are more informed, scholarly and nuanced. Teachers, students and educational support staff are involved in research and development projects, as well as collegial activities¹² to strengthen pedagogical competence. These aspects are now spreading to the faculty level and to our institutions as a whole.

Our systematic approach to develop and promote a collegial SoTL-culture and strengthen and develop the responsibility of the educational leadership vs. the individual teachers is seen as innovative and is being used as an example in the sector in Norway¹³. We have been used as a case study in research¹⁴, presented talks and published abstracts on this work at several national and international conferences¹⁵. At the institutional level, the implementation of a reward system for [Excellent Teaching Practitioners](#) (ETP) at UiB is a major milestone. Using this in our educational development and assessing the impacts on individuals and communities will yield new insights. bioCEED is, and will continue to be, a well-known advocate for teaching reward systems with SoTL-based criteria, and we have contributed actively and visibly to the Norwegian public debate and policy development in this area.

We have succeeded in giving students and teachers opportunities to develop teaching and learning, and the major challenge now is to go from 'project to mainstreaming'. Maintaining the cultural shift to a learning focused collegial teacher culture, and ensuring the full implementation of the teaching innovations making a programme wide impact and change.

It has been challenging to make efficient use of the quality assurance system as a mean to document teaching practice, assessment and evaluation, and the effects of change. These systems are still being seen by some as an administrative reporting exercise to 'satisfy the system', rather than a tool for developing educations. This is a missed opportunity that we are working to mitigate.

The bioCEED core team and the associated and growing 'coalition of the willing' teachers involved in development projects is a strong and active community. However, we are (still) not able to involve and include 'all', and we must stay conscious that some staff might feel unconnected with bioCEED, or that they are resisting the changes we impose and the directions we give.

Focus area 2: Innovative teaching

Developing and testing new teaching and learning methods and technologies is at the core of the bioCEED student-centred educational development. As illustrated by the bioCEED triangle (Fig 1), the broad scope and range of biology in science and society, and the variety of subjects studied within a biology degree, offer great potential as a 'lab' for testing out a variety of teaching and learning methods. Exploring these opportunities is the core of the focus area **innovative teaching**.

bioCEED expands and develops the learning environment by effectively combining traditional methods with novel field, lab, and digital approaches that support learning. Student motivation and learning outcomes are highly connected with using appropriate, student-active learning methods, and access to an appropriate learning environment. Under focus area 2 we therefore develop, test, and conduct research on a series of methods ranging from specific tools and learning approaches in single courses,

¹² For example, The Collegial Project Course (see footnote 9), Pedagogical courses for PhDs and postdocs, seminars, and workshops.

¹³ The [white paper on educational quality](#) (Meld. St. 16 (2016-2017)) specifically mentioned bioCEED as an example of innovative and excellent practice vs. developing a quality culture for education (ibid. p 70, 84)

¹⁴ Kottman, A, J Huisman, L Brockerhoff, L Cremonini & J Mampaey (2016) How can one create a culture for quality enhancement? CHEPS og CHEGG. [Available from the NOKUT home pages](#)

¹⁵ We have presented talks at [MNT-konferansen](#), [EAIR](#), [ISSOTL 2016](#), etc. See annual reports 2015 and 2016 for details.

to more crosscutting programme-wide initiatives. The wide range of activities and changes in specific courses are described in the 2015 and 2016 annual reports¹⁶. A cross-cutting theme is student involvement, not only in the form of student-active teaching methods but also by students taking the initiative to, planning, and executing learning activities¹⁷ We are seeing clear changes in the content, teaching methods (Figs 3, 4) and assessment (Fig 5) used in our courses.

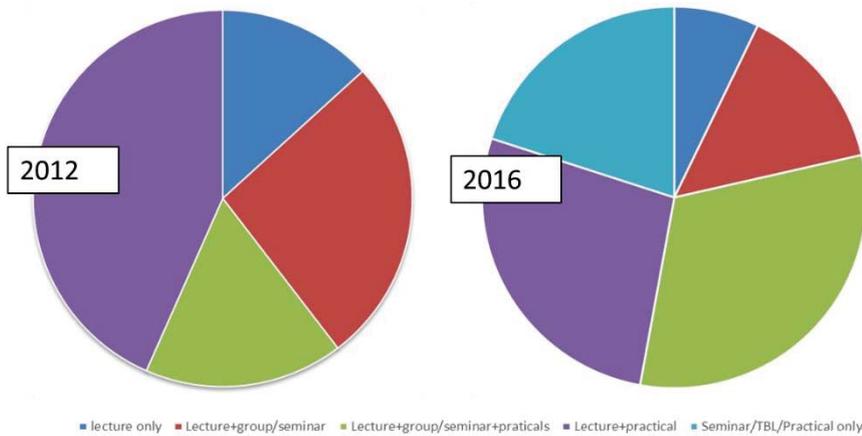


Fig 3. Teaching methods (occurrence) used in all BIO (Department of Biology, UiB) courses in 2012 (left, 68 courses) and 2016 (right, 70 courses). Source: course descriptions and ILOs.

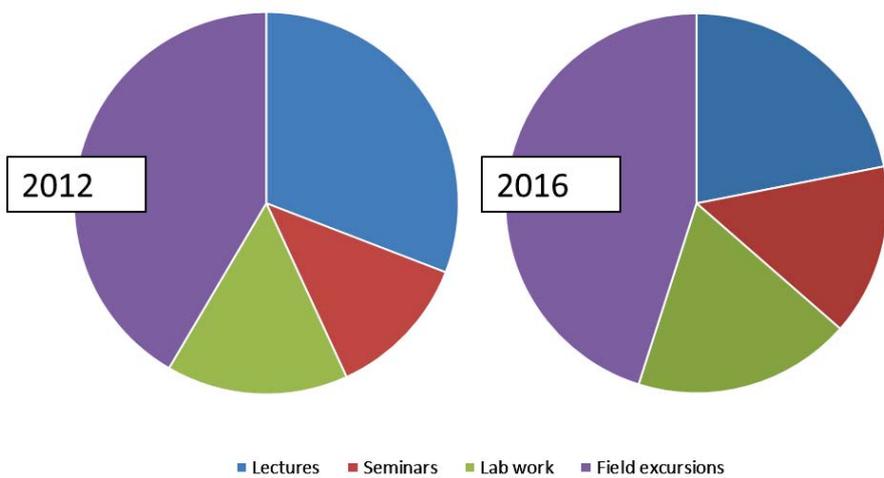


Fig 4. Teaching methods (hours) across bachelor courses in 2012 (left, 5 courses) and 2016 (right, 5 courses) at the Department of Arctic Biology, UNIS.

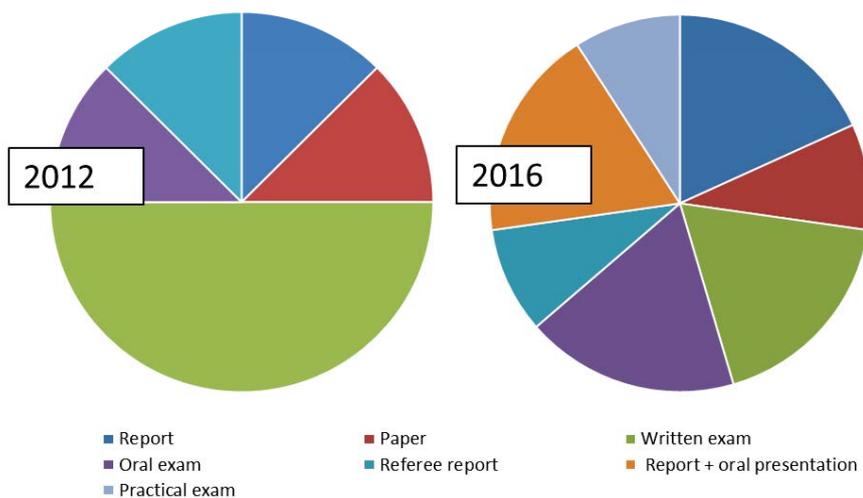


Fig 5. Assessment methods used in 5 bachelor courses in 2012 (left) and 2016 (right) at the Department of Arctic Biology, UNIS. The average number of assessment methods used per course was 1.6 in 2012 and 2.2 in 2016, respectively.

¹⁶ We are implementing more student-active teaching across the board, including team-based learning and flipped classroom teaching.

¹⁷ Students are becoming more actively involved not only as participants, but also in planning and executing learning activities through initiatives such as [ArtsApp](#), [bioSTATS](#), [codeRclub](#), [Teach2Learn](#), [biORAKEL](#), and [bioBREAKFAST](#)

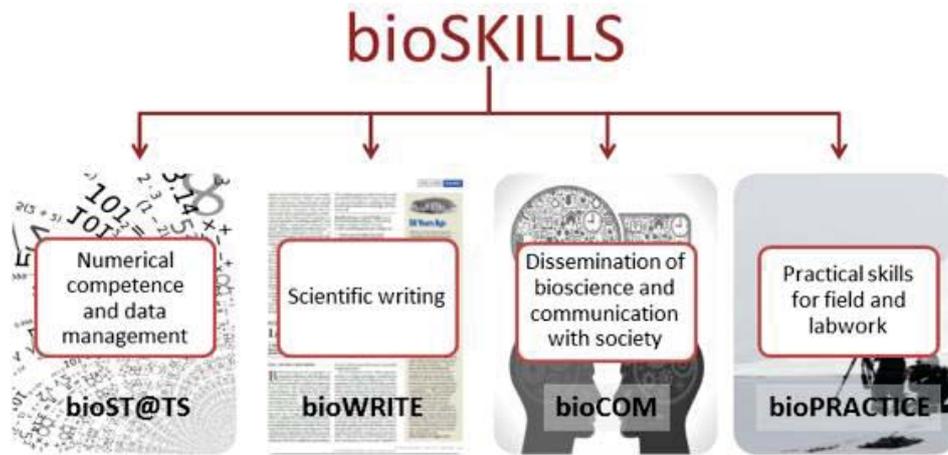


Fig 6. Conceptual diagram of the bioSKILLS framework. With bioSKILLS we are developing a digital learning platform that focuses on core transferable skill in biology education including subject-specific skills, communication skills, and numerical competences. The aim is to provide relevant resources that can be used by students and teachers both in courses across the curriculum and in independent work. This represents a framework for program-level alignment of core competences in biology.

Innovation

To strengthen transferable skills training and the focus on core competences in biology we are developing the learning platform bioSKILLS as a resource for students and teachers (Fig 6). The learning platform provides common toolbox aligning skill training between courses. In addition to providing students with tools and knowledge, we actively involve students in producing the learning content themselves (e.g. through the [Teach2Learn](#) video production). The project is part of the overarching bioCEED strategy to strengthen skills training and align this training throughout education – connecting the dots between the major (biology), the support courses/topics (e.g. statistics and scientific writing) and the practical training (e.g. lab and fieldwork). It is a resource for students and teachers – both in the program curriculum (implemented in courses) and in independent work (e.g. support students Master’s projects). The first module to be populated is [bioST@TS](#), which is designed to help students get a better grip on data handling and statistics in the context of biological studies. bioSKILLS is further strengthened by the collaborative projects with [SFU MatRIC](#) (math and biology), further external funding ([Thon award](#)). New modules will be developed in the next phase (Fig 6).

Challenges

As was pointed out under Teacher culture, a major challenge now is to go from ‘project’ to ‘mainstreaming’. Currently, several teachers have implemented new learner-focused pedagogical practices in singular courses, now a more wholesale implementation is the logical next step. We must further develop our platforms and teaching innovations and ensure full implementation across the curriculum. Another aspect of mainstreaming is to establish skills training, active learning, and assessment for learning as integral parts and a requirement in programmes (i.e., described in programme LOs; implemented and included in the quality assurance systems).

Studiebarometeret – the BIO results are yet not ‘excellent’. We see an increase, but not dramatically, in student performance indicators (credits produced per students, completed degrees, applicants).

Balancing work load – it is a challenge to not simply add to work load for students (and teachers) when introducing new methods and elements. This is also something we are currently working on.

Focus area 3: Practical training

Aims and Objectives	<p>One of the main hypotheses in bioCEED is that internships or placements in research, industry, and the public sector has an underexploited potential for strengthening student motivation and supporting learning, also in disciplinary subjects like biology (Fig 1). We believe that students best develop their biological competence through learner-focused pedagogies that expose them to varied and relevant experiences including laboratory work, field excursions, work placements. A central goal is therefore to observe and assess to what extent training in practical skills and workplace integration contribute crucial components to the student's experience of becoming a biologist.</p>
Achievements	<p>bioCEED has developed work practice courses for biology students, and these are now implemented as an elective course (BIO298) in the BSc and MSc programmes. These supplemented already-existing courses where students could conduct a small research projects under supervision (BIO299, AB207). A new dissemination project course (BIO296) is running at BIO for the first time in spring 2017, and a work practice course at UNIS is under planning. Skills training has also been increased in several other courses (both at AB and BIO). Sector contact is expanded across the curriculum, e.g. in the form of seminars with end user participation (these are student-organised activities) and invited talks in large-enrolment courses like BIO100 as well as in more specialized courses (see annual reports). We will take this further by making such courses a mainstay of biology education, and by implementing the theory behind work practice (engaging with biology through work) in other courses.</p>
Innovation	<p>Although work practice in educational programmes is nothing new within the vocational educations, it is uncommon in disciplinary programmes like general biology. Offering work practice courses to students in general biology has proven both effective for learning and motivation, and has also attracted considerable attention from other programmes and institutions. The work practice course initiated by bioCEED also has the novel aspects that student learning and development through the course are logged through blogs, discussions and a Facebook group, and that the blogs are part of the course deliverables and student assessment (blogs can be read here; most are in Norwegian). We research the impact of practice on student learning and thinking through the projects PRIME and 'Together for better learning'¹⁸.</p>
Challenges	<p>In intern-workplace relationships and in practical training components of courses more generally, we sometimes experience mismatched expectations. In work placements, there should be clear agreements regarding mutual expectations and specific learning objectives for the intern related to knowledge, skills and general competences. In research practice placements, students report time constraints, heavy workloads, and insufficient briefing and debriefing. While placement in 'real-life' situations is clearly motivational and rewarding for students, conflict of interests between educational goals (experience, acquiring skills, seeing the broader relevance) and workplace/research objectives (getting the work done, to a high standard) should be acknowledged, discussed and balanced. To establish internship courses in smaller communities like Svalbard has been more challenging and time-consuming than expected. There are simply fewer companies that can offer relevant training.</p>

¹⁸ 'Together for better learning' is a bioCEED-initiated project including researchers from three HigherEd institutions in Norway (Departments of Biology/bioCEED, Education and Global Public Health and Primary Care at the University of Bergen; CEMPE at the Norwegian Academy of Music, Oslo; Department of Teacher Education at the Norwegian University of Science and Technology, Trondheim). The five involved parties have, based on a common guide, conducted focus-group interviews with students that have finished practical training periods, to try to disentangle the learning that takes place during placement. What characterizes students' learning during placement? In which ways does this learning differ from the learning that takes place within the institution, as part of the ordinary on-campus teaching? How can higher education institutions and workplaces cooperate to optimize students' learning?

Focus area 4: Outreach

Aims and objectives

Sharing, communicating, and interacting with different audiences within academia and beyond over scientific developments, results, and their societal implications are integral parts of the research culture. Transferring these aspects into the educational culture is an important aspect of the 'cultural shift' within education that bioCEED aims to promote. Dissemination and outreach are thus important not only to promote bioCEED outputs, but also as a key part of the idea behind and goal of bioCEED. During bioCEED's first years, our communication and dissemination strategy has evolved from the early phase having a focus of the role and existence of bioCEED and SFUs (dissemination of awareness) to widening up and communicating our core activities (dissemination for understanding) and contributing to the policy and the public debate (dissemination for action)¹⁹. These different dissemination modes have different target audiences, require different communication strategies, and use different media.

Achievement

Up and running for 3 years bioCEED is now visible, both as a centre for educational development, and as a contributor and a player in the HigherEd policy debates in Norway²⁰. In true collegial spirit, this visibility is the result of engagement and contributions from many staff and students. In 2016, we started a monthly [bioCEED newsletter](#) that covers big and small bioCEED activities and outputs. This is an effective channel for communicating with collaborators and stakeholders, but also has an important local function in BIO and AB by giving visibility to small and large projects and activities. We are active on [Twitter](#), [Facebook](#), course blogs, and our [digital platforms](#) and [webpages](#)²¹. Our outreach is already making visible impact, influencing educational policy and development at our institutions²² and in Norway²³, and being visible on the international scene²⁴.

Innovation

Arguably, the perhaps most innovative aspect of our communication strategy is the breadth – we communicate our core focus areas, especially teacher culture and practical training, through a variety of channels from scientific publications and presentations via participation in policy fora to OP-EDs, opinion articles, and Twitter. And many, both students and staff, participate (see also part III).

Our online platform [bioSKILLS](#) is innovative in that it is specifically designed to be a tool in aligning biological and transferrable skills training across courses and throughout the programmes. The [bioST@TS](#) module is in operation, and is currently being implemented in several courses at BIO and AB. The learning tool [ArtsApp](#) is also being further developed, used, and tested. The bioCEED online platforms are well-known locally, and are becoming effective as channels for sharing and collaborating across the curriculum. They also function as pedagogical support for students and teachers. Some external use is starting, especially vs. ArtsApp, and we will work on exploiting this potential.

Challenges

Our strong engagement and agency vs educational development is an asset, but also a challenge. Recently, our PhD students went through mid-term evaluation (with flying colours!) but they were both challenged by the evaluation panel vs. their role as researchers vs. 'missionaries' for our pedagogical strategies and tools. These 'dual roles' is something we need to be aware of in the future.

¹⁹ We here use the dissemination for awareness / understanding / action framework as presented by [Hamsworth et al. \(2000\)](#)

²⁰ During 2014-2016 we gave 135 invited talks or presentations in different foras (2014: 29, 2015: 47, 2016: 59), published 9 scientific publications and conference papers, 2 as commissioned reports, and wrote 31 OP-EDs and articles in the media (2015: 18, 2016: 13)

²¹ See annual reports and the focus area 'outreach' [webpage](#) for details.

²² bioCEED has been instrumental in developing and implementing a merit system for [Excellent Teaching Practitioners \(ETP\) at UiB](#).

²³ The [white paper on educational quality](#) (Meld. St. 16 (2016-2017)) specifically mentioned bioCEED as an example of innovation vs. developing a quality culture for education (ibid. p 70, 84) and as an example of a successful SFU centre for excellence (ibid. p. 81).

²⁴ bioCEED leads a consortium that put in a successful bid, and hence will host, the [International Society for the Scholarship of Teaching and Learning](#) Annual Conference in Bergen 2018 (ISSOTL 2018, with the proposed conference title 'Towards a Learning Culture').

Behind the Scenes: Centre organisation and management

Question 5 in the Template for self-evaluation asks, ‘How has the internal and external organisational and management structure contributed to or hindered the achievement of the Centre’s goals’.

bioCEED consists of four partners, with different size, roles, and activity levels; and of a number of work packages and activities (Fig 7). Key to the daily operation and decision-making of the centre is the steering committee, which meets (over skype) weekly. The four partners (Department of Biology and Department of Education, UiB, Department of Arctic Biology, UNIS and Institute of Marine Research IMR) communicate weekly through the appointed members from each partner in the Steering committee, and they oversee bioCEEDs activities through their appointed board members.

The two biology departments (BIO and AB) are the hubs for the Centre activities, supported by dedicated staff from Department of Education and IMR. Institutional support from UiB and UNIS is strong, and the Centre and its activities are embedded and well integrated in the institutional structures and programmes. IMRs role is especially connected to sector contact and internships.

From the beginning, we have focused on strengthening the link between partners, not only within the core team, but also within the wider institution and educational activities²⁵. Collaboration over specific research and development activities gives synergies for accomplishing the Centre goals.

There are also challenges with being a broad consortium. AB is a small department with few employees and students compared to BIO. This needs to be considered when planning and conducting projects and activities to ensure that we utilize but do not overexploit the available resources.

Our International Advisory Board has been very helpful in providing feedback and pointing to areas where bioCEED could improve and increase input and output, especially on how we can communicate and spread our knowledge and practice to others. The Centre Board has a more overseeing role.

Student involvement is ensured through four student representatives (2 BIO, 2 UNIS) who are involved in the daily management and leadership of bioCEED as members of the Steering Committee and the Centre Board. In addition to running specific student-driven projects and seminar series²⁶, they participate in the ongoing R&D projects, discussions and the centers dissemination activities.

We cannot see any specific problems caused by the current organization and management, but we are aware of both ongoing and potential challenges that might arise (see Annual report 2016, page 6, ‘Lessons learned and challenges ahead’).

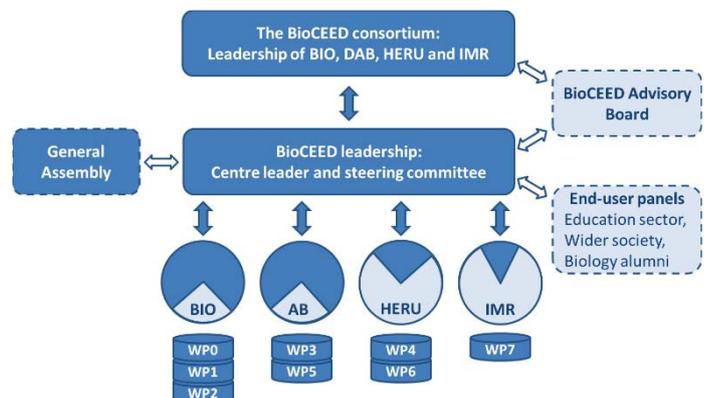


Fig 7. Project leadership, co-ordination, communication, and responsibilities. Governing (solid outline) and advisory (hatched outline) bodies are represented as rectangles, the educational activity at each of the partner institutions as circles, project work packages as stacked disks, and decision-making and advisory communication as filled and open arrows, respectively. Core bioCEED activities are indicated in dark blue, relationships to related activity at the partner institutions and with external bodies are indicated in light blue. For Work Package descriptions, see Fig 2.

²⁵ We have weekly skype meetings within the steering committee, joint research and development projects with participation from both UiB and Svalbard, research and teaching visits, joint seminars and workshops (which are streamed), and the bioCEED Newsletter.

²⁶ Student-driven initiatives include [biORACLE](#), [Teach2Learn](#), [bioBREAKFAST](#), [codeRclub](#), our student seminar series, etc.

Changes to bioCEEDs aims and objectives

In question 6 in the Template for self-evaluation, we are asked 'At this stage what changes, if any, would you like to make to your aims and objectives? Why?'. Well, we have already seen the need for, and implemented, a major organisational change.

The bioCEED **Advisory Board**²⁷ meeting at Svalbard in March 2016, engaged in productive discussions with the bioCEED steering committee, as well as observing bioCEED activities. The resulting bioCEED Advisory Board report (April 2016) contains an assessment of the status and deliverables of the centre, and provides a set of recommendations. In particular, they recommend greater focus on visibility, impact, and dissemination, and less outward exhibition of the 'inner workings' of the centre. They also discuss how to assess and document impact, change, and success.

In response to these challenges and recommendations, the bioCEED steering committee went through a process where we identified our core strengths and strategic priority areas for development. This process resulted in the recognition of four strategic focus areas, Teacher culture, Innovative teaching, Practical training, and Outreach. We then repackaged our activities under these four headings, and the bioCEED strategic focus areas are now the core of our communication in all channels, including the web pages and the annual report.

A second process resulting from the Advisory Board's report was to identify specific topics and impacts that we will prioritize in our documentation and external and internal communication, and to identify the target audience and relevant channels for each of these topics and impacts. In particular:

- 🔗 **bioCEED internal communication** - will be solidified and mainstreamed to become part of 'everyday practice' in our departments. The Newsletter is core to this.
- 🔗 **bioCEED external communication** - 'Dissemination for understanding' will be a priority, and we will seek to communicate the outcomes of our core activities and strategies both through scholarly channels both nationally and internationally, and vs. the media.
- 🔗 **bioCEED as a coordinator** - We will seek to play an even more active role as a hub for collaboration over HigherEd development and with society. Relevant topics and field include promoting theory-practice-societal integration into disciplinary educations (c.f., Fig 1), building SoTL-based teacher cultures, creating digital learning platforms for aligning skills training in disciplinary educations, and integrating workplace practice in disciplinary programmes. Our role in taking initiative to a [Forum for Educational Leadership](#) under Biofagrådet is an example and a starting point for this new approach in our outreach work²⁸.

Over the next 2-3 years, we will test and develop our new organisational structure and our new communication strategy. A challenge with our new organisation is that while it better reflects our outputs, we still need to maintain the focus on, synergies of, and connections between the original work packages. These will now be secured through the 'inner workings' of the centre, whereas communication will be organized through the four focus areas.

²⁷ See the web page for Advisory Board members <http://bioceed.b.uib.no/about-bioceed/advisory-board/>

²⁸ In March 2017, this forum met in [Bergen](#) to discuss the emergence of Merit systems for Excellent Teaching Practitioners in Norway.

II. THE GOALS SET FOR THE CENTRES FOR EXCELLENCE (SFUS)

In question 7 in the Template for self-evaluation, we are asked to ‘reflect on how effective the Centre has been in meeting the objectives set out for SFUs’. As demonstrated in section I, bioCEED has been highly effective in meeting several of these objectives. Our role and impact varies according to the different objectives, however, and we will therefore comment briefly on each below.

Objective a: Provide excellent R&D-based education

As an externally funded Centre co-hosted by four institutions, our role is not to *provide* education. The educations that we work with are owned by our host departments, the teachers are employed there, and the students apply to, register, and receive their education from the host institutions, not the Centre. Rather, the SFU’s role is to support and stimulate educational development. Hosting a centre of excellence in university education may, as emphasized by Gosling and Hannan²⁹, serve to influence and change the organisational culture of universities and their departments. An important success factor is the extent to which such a centre is able to involve individuals and parties outside the boundaries of the centre. At bioCEED, we are conscious of this and have, from day one, involved students and teachers across our host organisations. We have taken part in, and organised, workshops, seminars and presentations to involve as many as possible. Towards this end, we have also established contacts and cooperation with external partners at other institutions in Norway and abroad.

Objective b: Develop innovative ways of working with R&D-based education

Our main contribution has been to infuse a project-based working method into education. Project thinking comes naturally from our goal to develop a collegial SoTL culture based on the research culture. The impact has been remarkable – when educational development is partitioned into projects, small and large, change seems more manageable and less ‘dangerous’ than when education is seen as an eternal ‘thread’ running alongside the (more dynamic and pressing) research activities at University.

Objective c: Stimulate and reward work that takes place in the interaction of students, teachers, support services and the knowledge base of the education.

As a project ourselves, and with a ‘libero’ position as a (well-funded) relatively small, and young unit outside the formal decision-making structure of the University, bioCEED has the opportunity to be vocal, brave, and experimental. Our goal to grow a ‘SoTL culture that involves all’ works explicitly towards integrating and activating the wider educational community. Involvement and inclusion does not come without requirements and demands, however, and we have been clear and vocal in our opinions about the responsibilities, not only the rights, of students, staff, and institutional leadership.

Objective d: Contribute to the development and dissemination of knowledge about educational methods that are conducive to learning.

Our contributions to development and dissemination to date are described in part I and in the annual reports. Our most lasting contribution, however, will hopefully be to stimulate a culture where development, documentation, educational research on our own practice, and dissemination is seen as an integral part of the everyday workings of being a teacher, and a teaching unit, in HigherEd.

²⁹ Gosling, D. & Hannan, A. (2007) Responses to a policy initiative: the case of Centres for Excellence in Teaching and Learning. *Studies in Higher Education*, Vol. 32, No. 5, pp. 633–646.

III. CENTRE IMPACT, DISSEMINATION, AND SUSTAINABILITY

Question 8. How has the work of the Centre made a difference for *students' learning*?

bioCEED has been instrumental in introducing new teaching methods and new elements in the biology educations at the host departments BIO and AB. Active learning methods (Fig 3 and 4), digital teaching tools, and more aligned assessment (Fig 5) are now used extensively. This shift is likely to positively impact student learning, but it is still too early to detect quantitatively effects on retention and student performance. Preliminary analyses of single courses and interventions do indicate that we are on the right track, however, as documented for example in a study published by Jenö and colleagues³⁰ and in student feedback on introduction of flipped classroom in a course at AB (Appendix 2).

Our focus on building a culture for excellence in education is also proceeding. Working with the teachers to grow a collegial learner-focused SoTL-culture is likely to positively impact student learning longer-term. This is because teachers will become more aware of, gain experience with, test the outcomes of, and refine and align courses and programmes, using learner-focused teaching methods.

Student-active learning methods and development of digital tools has already involved students more as partners in teaching and learning. They participate more in taking initiative to, and developing classroom activities, and also in the actual production of knowledge³¹. Focus on skills training and societal relevance has introduced new elements into biology education, and work practice students report higher motivation and increased learning outcomes of skills as well as biological theory³².

The collegial culture and practice developed at bioCEED has been recognized as transferable to other educations and institutions³³. Our educational research, and especially joint educational development projects with external partners (e.g. ArtsAPP, IntPART projects, COPUS, see details in part I and in the annual reports) allow us to cooperate, develop and spread innovation and excellence in teaching and learning more efficiently, both nationally and internationally. UNIS is highly international, with students and staff from all over the world and extensive use of adjunct professor and guest teachers. UNIS may thus function as a 'hub' where people and practices meet and exchange.

Question 9. What impact has the Centre had nationally and internationally?

bioCEED develops open-access biology-specific digital tools and platforms. We are already seeing interest, we are developing collaborations over specific issues, and we thus expect that biology educations in other institutions will both contribute to, and use these platforms in the future. bioCEED took the initiative to develop the National Forum for Educational leaders in Biology, which has become a productive meeting place for discussions and exchange over (biology) education (see also page 11). The bioCEED Survey 2015³⁴ collected extensive data on biology educations in Norway. This baseline will be used further in bioCEED's educational research. The survey will be repeated in 2019 and we believe that knowledge provided through the survey(s) and the downstream research and scientific publications based on the survey material will benefit biology educations in Norway and will be transferrable to other subjects and regions.

³⁰ Jenö, L. M., Grytnes, J.-A. and Vandvik, V. (2015) [The effect of a mobile-application tool on biology students' motivation and achievement in species identification: A Self-Determination Theory perspective](#). Computers and Education, 107, 1-12

³¹ For example [Teach2Learn](#), where student produce videos that are used in the teaching and assessment of the course.

³² G. Velle & T. Hole (2017) Developing work placements in a discipline education [Proceedings of the MNT Conference 2017](#)

³³ Meld. St. 16 (2016-2017) p. 84; Kottman, A, J Huisman, L Brockerhoff, L Cremonini & J Mampaey (2016) How can one create a culture for quality enhancement?. CHEPS & CHEGG.

³⁴ The bioCEED survey can be downloaded from <http://bioceed.b.uib.no/the-bioceed-survey-2015/>

bioCEED's approach to developing a collegial and scholarly teacher culture has become a model and an example on how to develop a quality culture³⁵. We are advocates for evidence-based, effective merit systems, both in the public debate, within the HE sector and at our own institutions. bioCEEDs work practice in discipline education has also generated interest from other educational communities.

Around the last call for SFU applications, bioCEED was used as a best-practice example by many of the potential and actual applicants, and we gave a number of seminars and talks (see 2016 Annual report).

We are attractive as a collaboration partner in educational development and research, and cooperate with several partners both nationally and internationally. Examples include:

- A joint project with SFU MatRIC on creating synergies between math and Biology courses
- LTH, Lund on teacher culture and merit systems and RIVA Institute³⁶ on education quality
- Uni of Minnesota on teaching methods, student and teacher attitudes, and gender issues in STEM
- A growing portfolio of externally funded projects (see Annual reports). E.g. bioCEED is involved in four projects funded by IntPART for Excellent Education, Research and Innovation³⁷
- At the National conference for STEM Education 2017 – Transformative Education³⁸ bioCEED-associated teachers contributed 10 papers, which was 25% of all contributions at the conference.
- Spearheaded by bioCEED, UiB will host the ISSOTL Conference 2018 in Bergen³⁹

A central theme in bioCEEDs work is to develop stronger and better connection to society and societal needs and challenges. Integrating work practice in biology education is one effective way of doing this. Work practice hosts are involved in developing the practice courses, and also give input on biology education more generally. We further involve external partners and end-users in student meetings, annual career days, and as guest teachers. Impact of bioCEED in the wider society is also facilitated by [ArtsAPP](#), which provides freely-available species-identification tools that can be used by and raise awareness in schools and the public. Both bioCEED and the host department staff and students have contributed extensively to the public debate on teaching and learning and merit systems in HigherEd.

Question 10. Effects of SFU status and funding (additionality)?

The status as a Centre of Excellence in Education has been essential for our development and current standing in education and society. There is little funding (and awareness, outside pedagogical units) available for research on learning in higher education in Norway. The SFU status and funding provides impact, resources and visibility. bioCEED has become a hub for competence, engagement, knowledge and innovation by bringing together people from different backgrounds and areas. This again has become an incubator for ideas and projects and has catalysed the processes initiated by the centre. The financial resources and the people affiliated with the centre allowed us to work on many fronts, areas, and activities at the same time, creating change and facilitating development at a faster pace than what is normally the case within academic environments. The SFU status has been essential for visibility and dissemination both within and outside the partner institutions, which again has made it easier to establish new cooperation and obtain external project funding. More broadly, the existence of SFUs give weight to educational quality work at the university, balancing the focus on research.

³⁵ Documented by how we have been invited to give talks and keynotes at educational development and research conferences, used as a case study in research, and referred to eight times in the White Paper on Educational Quality (Meld. St. 16 (2016-2017)).

³⁶ RIVA is a 'think-thank' for educational development, http://assessment.vt.edu/The_Riva_Institute.html

³⁷ A RCN program for international collaboration <https://www.siu.no/eng/Programme-information/Cooperation-outside-the-EU/intpart>

³⁸ MNT konferansen (The Norwegian STEM conference) 2017 <http://www.realfagsrekruttering.no/konferanser/mnt-konferansen-2017/>

³⁹ ISSOTL 2018 'Toward a Learning Culture' <http://www.issotl.com/issotl15/node/28>

Question 11. How have you evaluated results/impact at the centre, project and personal level?

Centre and project results and impact are evaluated through several mechanisms and bodies: **Student** representatives, student meetings, student feedback, and student data provide the most important and continuous evaluation of our standing, results, and impacts. Also, the **teachers** working with us (and occasionally against us), give feedback that provides essential information on how to better aim and adjust activities and information. The **Centre Board** has a formal overseeing role, based on annual reports, accounting and consortium agreements. Our **Advisory Board** represents a diverse range of competences and stakeholders that are important to bioCEED, and it has contributed with constructive and critical input (see 'Changes to centre aims and objectives', page 10). bioCEED was analyzed by **CHEPS/CHEGG** in their report *How can one create a culture for Quality Enhancement?* as well as by **NOKUT** in the report *På vei mot det fremste?*

Our results and impacts are also documented through our own data and research on teaching and learning in biology⁴⁰, our outreach, our success in obtaining external project funding, and invitations to participate and contribute in national and international partnerships. Students and teaching staff participation in activities and projects is another means to monitor and evaluate impact and results.

The national data on educational quality and 'production', student performance, and student satisfaction⁴¹ will also be an important source of data to evaluate impact longer-term.

Personal level

Documentation of teaching practice, learning outcomes, changes, and their impacts are essential components of a SoTL culture. Another key feature is sharing and discourse between teachers, and between teachers and students. The teachers following bioCEED courses and workshops are trained in writing teaching portfolios, and in reflecting on their teaching practice and philosophy in relation to the literature. Through these SoTL activities, individual teachers now reflect on and evaluate their own practice as well as their experience with participating in bioCEED activities.

Students are also reflecting more –for example in the work practice course where they write reflective blogs –providing them with self-assessment and reflection and us with insights into student thinking and learning and an evaluation of the activity/course. Similar activities are now being implemented in other courses. Self-reflection as a learning tool is an untraditional approach in biology. bioCEED offers students seminars on 'learning to learn'-to support their meta-perspectives on studying and learning.

Question 12. Most successful dissemination (provide documentation⁴²)

More than the specific *type of dissemination*, we will argue that our strategy of applying a wide array of different dissemination approaches towards *specific focus areas* is the key to our impact and success. An example is our dissemination from the focus area *Teacher culture*. 'A teacher culture based on the research culture' has become a slogan and trademark for bioCEED. Locally, this is used in the day-to-day communication with teaching staff, as a motivation for attending local collegial activities and participate in the ongoing conversation on teaching and learning in the local scientific community. Data collected to support our approach has been gathered (bioCEED Survey 2015), and used in communication with leadership and strategic foras to promote the institutional support for

⁴⁰ For example; bioCEED Survey, own data on teaching and assessment practice (e.g., Figs 3-5), PhD projects, publications (see [Cristin](#))

⁴¹ See [DBH, Studiebarometeret](#)

⁴² Annual reports list all dissemination activities. During 2014-2016 we gave 135 invited talks or presentations in different fora (2014:29, 2015:47, 2016: 59), published 9 scientific publications and conference papers, 2 as commissioned reports, and wrote 31 OP-EDs and articles in the media (2015: 18, 2016: 13). See also [Cristin](#) for full list and onfo on publications.

educational development (e.g. establishing a merit system for education at UiB). The approach, and the outcomes, has been disseminated to a wider public in educational development through papers and presentations at national and international conferences (e.g. EAIR, ISSOTL. See Annual reports for full overview). Big and small stories of SoTL practice and collegial activities are told through the monthly Newsletter and web pages. Documentation and dissemination are also done by the teachers and students themselves, through internal reports, conference presentations/papers (e.g. [MNT 2017](#)) and teaching portfolios. bioCEED and associated staff have participated in the public debate on teaching and learning and merit systems for teaching (see Annual report 2016). The success is therefore a result of a targeted focus on a topic, and our 'story', rather than the type of dissemination.

Question 13. What exit strategies are in place for when the SFU funding period ends?

When the SFU funding period ends, bioCEED will be well established as an active research and development node within HigherEd development and research. Our 'case' will be biology, but our outcomes will be relevant beyond the subject. Several of the key positions are permanently employed at the host departments (e.g., the educational technicians; coordinator), hence we do already have some base funding. We will negotiate with UiB for more base funding, depending on our success during the SFU funding period. Based on our current trajectory, we expect to be able to secure permanent positions and some base funding. As the SFU funding only makes up 1/3 of bioCEEDs current budget, the institutional support and ability to attract external funding is our major funding sources now and in the future. The proposed 'competitive arenas' for educational funding, and increased investment in research on learning in higher education provide opportunities for increased funding and activity.

We aim to have a good dynamics in place between project-based activity to allow and support new ideas and initiatives, and mainstreaming of the successful initiatives into the departmental structures and programmes. We will collaborate internally, across the university, and internationally.

The collegial SoTL culture will be well established. It will be supported by strong educational leadership, resources to allow continuous development and research, efficiently used quality assurance systems, aligned and effective educations, collegial meeting places to foster creativity and collaboration, and a merit system that recognizes excellence and that puts the leading educators to good use for the benefit of the community. The Pedagogic Academy will play a key role towards this.

IV. PLANS FOR THE SECOND PERIOD

Our three most important priorities for the second period are:

1. **Alignment** – we will make optimal use of our platforms, within-course initiatives, strategic program development, and quality assurance systems to develop truly constructively aligned study programs, focusing on developing key skills and competences through the curriculum.
2. **Mainstreaming** – we will develop mechanisms for mainstreaming successful innovations into our decision-making structures and programmes. This will ensure that good practices are implemented and exploited optimally, and also make room for new development projects.
3. **Project culture and research** - we will build on and further develop the emerging project-based collegial SoTL culture within our host institutions. This will benefit educational development, student learning, teacher job satisfaction, collegiality, and departmental outcomes. In particular, a collegial SoTL culture will promote educational excellence, development and documentation of teaching and learning outcomes, and research-based education (i.e., student research experiences; evidence-based best practice; and up-to-date course content).