



Annual Report 2022



Content

Annual report 2022	2
Appendix 1 Focus area and action report 2022	13
Table 1. Learning culture action plan	14
Table 2 Innovative teaching	18
Table 3 Practical training	24
Table 4 Outreach.....	26
APPENDIX 2 Overview of dissemination and outreach activity	28
<i>The bioCEED community and beyond – seminars, workshops, courses</i>	28
Table 5 bioCEED seminars and bioCEED Professional development activities 2022.....	28
Table 6 bioCEED student meetings and seminars 2022	29
<i>bioCEED reaching out - conferences, events, meetings and seminars</i>	30
Table 7 Presentations at scientific conferences (peer reviewed) 2022	30
Table 8 Presentations at seminars, workshops, conferences, etc 2022	31
<i>bioCEED publications 2022</i>	34
Master theses	34
Op -eds 2022	35
Hearings	35
Podcasts:.....	35
<i>bioCEED online and in the media</i>	35
<i>Contribution to quality development in higher education</i>	35
<i>bioCEED platforms</i>	36
<i>Awards</i>	36
APPENDIX 3 Accounting	37
APPENDIX 4 Externally funded projects	37

Front page photos: Annemijn Sandig, Rein Aasland, Jens Ådne Rekkedal Haga, Oddfrid Førland, Jonathan Soulé, bioCEED.

Annual report 2022

Introduction – the bioCEED vision and results compared to the centre plan

bioCEED’s vision is to develop relevant biology educations that fill future needs in science and society by connecting scientific knowledge, practical disciplinary and transferable skills, and societal applications. These connections should guide the development of curricula as well as teaching and learning methods throughout course portfolios and programmes.

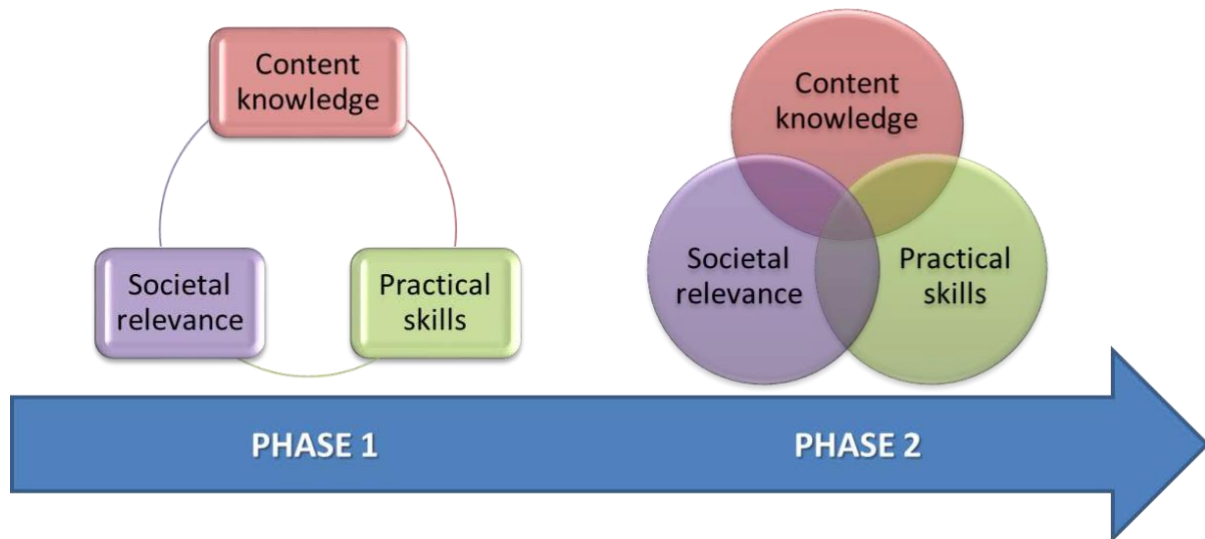


Figure 1. The evolution in how the bioCEED triangle has been understood and used – from the early-stage focus on interlinking three different and distinct aspects within the domain of biology, to the later-stage more holistic approach expanding the scopes of each of the three aspects, while also integrating and linking them more closely with each other (from Self-evaluation, 2017).

During the mid-term evaluation process in 2017 where we redesigned our work packages into focus areas (Figure 2), clarified our vision (above and Figure 1), and developed an Action Plan for phase II (2019-2023).

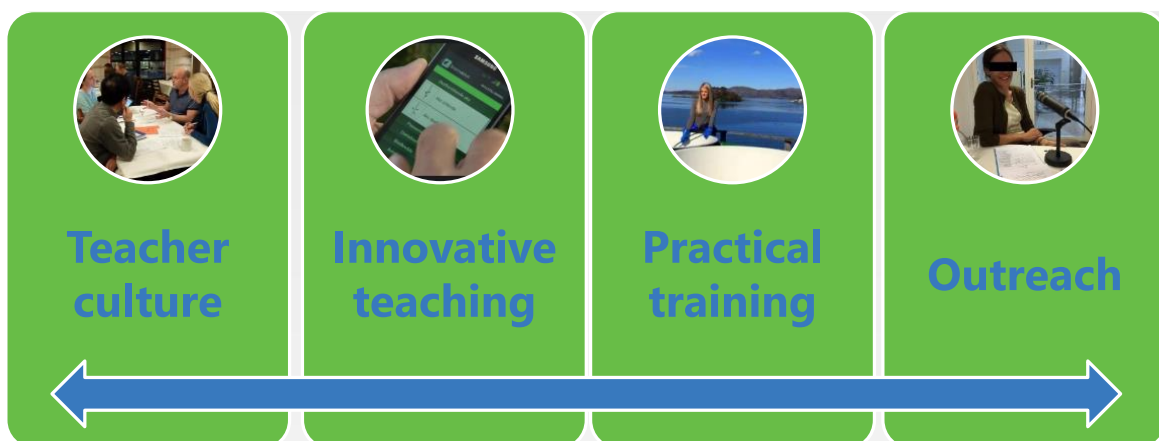


Figure 2. bioCEED focus areas.

A prerequisite for achieving this vision is a scholarly, inclusive and collegial *Learning culture* (Fig 3). After all, it is the students, teachers, and educational support staff that will do the work of developing *Innovative teaching* and ensuring relevant and authentic learning experiences through *Practical training*. In this work, bioCEED is a catalyst, initiating projects that facilitate the corners of the biological triangle, biological theory, practical skills, and societal relevance (Fig. 1). The interactions have created tensions and feedback loops, which have facilitated content curriculum development (i.e., a movement towards a more integrated triangle; Phase 2, Fig. 1). bioCEED has thus progressed from a focus on “how” to teach and learn biology towards a focus that also concerns “what” biology education is and should be.

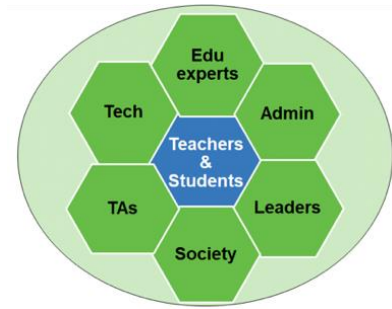


Figure 3. Excellence can only be achieved if all relevant stakeholders in teaching and learning being involved, included, and informed.

All actions in the Action Plan are designed to support the vision and develop the Focus areas. As the various actions evolve, there is need for adjusting and revising. For example, because the activities and innovations in *Focus area 2 Innovative teaching* and *Focus area 3 Practical training* are interdependent, there is much overlap, and it is sometimes difficult to place them in one of the focus areas – so they are in both. We continue to make (small) adjustments of actions and targets, to include a broader range of projects, collaborators, activities, audiences, and potential outcomes. We see this more as adjusting the map to a changing landscape, rather than deviating from the Centre plan, as the adjustments are in line with the overarching vision. We track our progress according to the Action Plan (see Appendix 1).

Impact reporting 2014-2022

To document impact of the SFU scheme within certain areas, the SFUs were asked to report activities/results and impact for the entire center period within February 1st 2023 ([Full report](#)¹ from p. 3). We were asked to report in the following categories:

- Work relevance
- Development of study programs and courses
- Impact for students, staff, quality, education and research integration and non-academic partners and beyond
- Added value of the SFU program, compared to other project funding sources.

bioCEED can show significant impact on both work relevance, study programs/courses and outcomes for stakeholders, as well as effects beyond our partners and collaborators. Although the activities reported cannot reflect the full scope of our work, the report shows that bioCEED during the center period have given 1335 students (units) practice or skills training opportunities (a total 24 105 days), in activities ranging from work practice courses, mentoring, research practice, research assistance and skills training. For staff and collaborators, 241 people have participated in cross-sectoral mobility (total 5266 days), as work practice hosts, through research and teaching mobility and as adjunct faculty.

¹ https://bioCEED.uib.no/dropfolder/bioCEED/bioCEED_Effektrapportering_2014_2022.pdf

bioCEED has, in some sense, contributed to the development of all study programs and courses at our biology departments. Courses and programs have been developed in partnership with teachers and students, benefitting all students in BIO (UiB) (>750 students/year, in particular BSc Biology app. 200 students) and all students at UNIS including biology, earth, and physical science (> 800 p/y, in particular AB BSc Bachelor 40 p/y). These developments are documented in previous annual reports, project reports and scientific publications and conference papers.

In summary:

- Students experience and value that they now experience active teaching methods and evidence-based teaching in biology courses across the curriculum.
- Teaching and research are linked and integrated in courses across the curriculum, e.g. training students in the research process (building research skills and competences), involving students in ongoing biological and educational research (authentic learning experiences).
- Students can gain practical experience through work-practice courses and skills training opportunities offered in the discipline-based educations.
- bioCEED develops and maintains a range of digital platforms to support student learning specifically aimed at strengthening transferrable skills, research and teaching integration, and discipline-specific skills.
- bioCEED documents student outcomes and experiences (discipline-based educational research, SoTL).
- bioCEED works systematically with students, faculty, and staff, to promote cultural change towards a scholarly approach to teaching and learning (SoTL and evidence-based teaching). This includes a range of professional development opportunities, arenas for sharing and developing teaching and learning, and educational research and SoTL.

Our years of (reported) outreach activities (2014-2021) are summarized in Table 1.

Activities	External	Internal (UiB & UNIS)
Seminars	15	59
Professional development	7	56
Student meetings & Seminars	2	83
Presentations at scientific conferences	21	2
Presentations at seminars, workshops	168	81
Sum:	213	281

Table 1. Outreach 2014-2021.

In addition, bioCEED has published 44 scientific publications (31) and scientific conference papers (13) on teaching and learning. These numbers show that bioCEED has impact both internally (UiB and UNIS), as well as nationally and internationally.

Added value of SFU scheme

In our view, there are two critical aspects of the SFU scheme that allow us to accomplish tasks otherwise impossible; these include the timeline and the scope of the scheme.

The extended timeline has been critical for us to realize many of our goals, largely because so much of what we have accomplished relied on staff and student buy-in. Buy-in is something

that relies on the existence of a strong community with a shared language and set of values, and this takes time to create. Further, the 5+5 scheme promotes evidence of institutional buy-in, via commitments that are concrete and do not oscillate with changing leadership, top-down priorities, etc., and allows us to scale up our initial efforts into curricular and extracurricular innovations that are integrated into our programs.

The scope of bioCEED is extensive, and it is difficult to image how such an initiative could have been so successful under any other funding mechanism. The SFUs are not course- or program-based, allowing for (a) the participation of individuals from all roles in academia—from bachelors' students to administrative staff to full professors—and (b) the creation of novel collaborations, including with other SFUs. Some of these collaborations (e.g., with iEarth and MatRic) have allowed us to build new Disciple-Based Education Research communities that can collaborate across Norway, that are not necessarily based in a single discipline. Products from these collaborations, as well as more local projects, have significantly increased Norway's footprint in the research literature, and led to findings that are not simply theoretical, but immediately put into action in teaching and learning. In other words, our findings are immediately translated into practices that benefit students.

We also value that the selection process for SFUs is based on quality and not subject to political whims. We acknowledge that SFUs involve the allocation of significant funds, but these are still relatively small compared to that of research centers. Given that the SFUs have accelerated national efforts to improve higher education, it is clear that the resulting value far exceeds the investment.

Executive summary 2022

In **2022**, bioCEED has continued to develop biology education to fill future needs in science and society, and to facilitate the scholarship of teaching and learning across higher education in Norway and beyond. Our activities are guided by **our four focus areas – learning culture, innovative teaching, practical training, and outreach**.

Details on progress according to the Action plan can be found under each focus area and action in Table 1-4 (Appendix 1). Overall, we consider our results and impacts to be in line with the plans. How activities are designed to contribute to the goals of the center are described above.

Establishing and maintaining a scholarly and [collegial learning culture](#) continues to be a top priority for all engaged in bioCEED. Our efforts here include both formal (e.g., courses) and informal (e.g., workshops) activities, and both low-effort commitment engagement (e.g., seminars) and high-effort commitment engagement (e.g., educational development projects). Either path leads to meaningful engagement, and we are committed to ensuring this learning culture persists and grows post-SFU funding and beyond our host departments. Learning culture and educational leadership highlights in 2022 include:

- The UNIS [Learning Forum](#) gathered 74 participants from all UNIS departments including bioCEED staff and students from Bergen. The topic this year's was education for sustainability and digital tools, with bioCEED contributing with keynotes, talks, workshops and poster presentations.

- Catching up from the pandemic break, bioCEED hosted two Teachers Retreats at BIO-UiB in 2022². In the June retreat³ we workshopped program design, alignment and program learning outcomes with biology teaching staff in intensive group work. In November⁴ we retreated once more, this time to take a deep dive into *assessment*.
- We are proud of the student-led projects that include the second offering of the student research conference SCOPE⁵ (Student-led Conference on Polar Environment), at UNIS, and the peer-reviewed student journal Bikuben,⁶ which released its first printed issue.
- We continue to support **bioHIVE**, a learning community involving our Students as Partners in the Centre, and **bioBERG**, a research group akin to a journal club designed to support researchers involved in STEM education. These groups continue to create a sense of community, the conviction that our work is *broadly relevant* and meaningful, greater self-efficacy regarding research abilities, and critically, more and better products.
- bioCEED, in collaboration with SFU iEarth, hosted a mini symposium⁷ highlighting STEM Education Research. Invited speakers included bioCEED, UPED and iEarth researchers, and international guests. The aims of this symposium were to highlight the exciting work of our early-career researchers, give participants time to network, and ideally generate new ideas for future collaboration. [We succeeded on all points.](#)
- We develop and offer professional development courses for all groups of staff involved with teaching and learning, including a 2022/23 offer of the course **Collegial Teaching and Learning in STEM** (MNPED660) at UIB/UNIS with 21 participants from 7 departments. The joint bioCEED and iEARTH course **Leading Educational Change through SoTL** was concluded in 2022. 19 participants from 4 institutions completed the course (5 ECTS), completing 7 SoTL projects. Several projects will be presented at the MNT2023 conference, and the course concept was presented at the EuroSoTL2022 conference. In addition to the continuation of the **teaching and learning course for PhDs**⁸ at UNIS we are also planning, in collaboration and led by iEarth, to develop the course into a [UNIS-UiB Field Teaching Assistant Academy towards a national FTA course](#). We expanded the **BIO-UiB TA course** beyond BIO, to initially include chemistry. Our hope is to use this as a “proof of concept,” and then discuss further expansion with additional departments at the MN faculty.
- We **collaborate extensively** with others to share, develop and research teaching and learning. Examples include; bioCEED partnered with SFU MATRIC director and Nordic Journal of STEM Education (NJSTEME) editor T. Gjesteland (as well as faculty from NTNU, UiS, and LTH) to lead a workshop for scientists interested in developing their STEM-education work for publication in NJSTEME. SFU MATRIC and SFU iEarth partnered on a proposal to NFR (TARA “Test Anxiety—Rethinking Assessment in Higher Education”). bioCEED continue to contribute to *Nasjonalt fagorgan for biologi* (Biofagrådet). bioCEED joined colleagues in Finland and Estonia on a recent NordPlus proposal, in which we aim to share ideas and investigate strategies for TA professional development at our respective departments and institutions. bioCEED and iEarth collaborated to host three visiting researchers; Alyssa Olson (University of Minnesota) took part in the Plant Functional Traits Course (PFTC4) in Aurland. Alyssa’s role was to both assess the course itself, and to lead a Science-Communication Module with the other course

² one of which ironically led to a local covid outbreak.

³ <https://bioCEEDnews.w.uib.no/2022/06/20/bioCEED-teachers-retreat-finally/>

⁴ <https://bioCEEDnews.w.uib.no/2022/12/13/bio-teachers-retreat-2022/>

⁵ <https://bioCEEDnews.w.uib.no/2022/11/10/scope-2022-the-student-led-conference-on-polar-environments-was-a-full-success/>

⁶ <https://bikuben.w.uib.no/nb/>

⁷ <https://bioCEEDnews.w.uib.no/2022/09/30/mini-symposium-in-bergen/>

⁸ <https://bioCEEDnews.w.uib.no/2021/03/17/experiences-from-a-teaching-learning-course-at-unis/>

participants. Sarah Hammarlund (University of Minnesota) was supported by an iEarth mini-grant to investigate Sense of Belonging in introductory-STEM courses, and Robin Costello (Auburn University) was supported by a bioCEED mini-grant to lead the analysis of data on test anxiety in introductory-STEM courses. The working group, including Mirijam Glessmer (iEARTH), conducted qualitative data analysis, presented our findings at the STEM Education Research mini-symposium and bioBERG, and submitted one manuscript (another is in preparation).

- bioCEED expertise has been sought in many areas, including contributing to building knowledge and supporting the development and implementation of evidence-based learning and pedagogical merit systems across Norway. We are active in the ongoing debates and give input to policy development in Norwegian Higher Education (see Appendix 2). Cotner is chairing the external review of two BIO study programs—at NTNU and UiO—and gave feedback on several SFU proposals in early 2022.

Innovative teaching, Practical training, work relevance and developing research skills are essential in bioCEED efforts, as can be seen in the report on impact⁹ (summarized above). Highlights for 2022 in the focus areas **Innovative teaching** and **Practical skills** include:

- Further development and support of the **bioSKILLS' platforms** [bioST@TS](#), [bioWRITE](#), [bioSKRIV](#) and [bioPITCH](#), which have become central teaching resources in more than a dozen biology courses at BSc and MSc levels, including three of the five courses in the BSc and the two introductory courses in the MSc in Biology at BIO, as well as several AB-courses. We collaborate with NTNU faculty to make bioST@TS more broadly applicable.
- The **bioCEED toolkit**¹⁰ was launched in 2022, where we present short cases that describe some of our teaching and learning innovations and activities. We hope these can inspire other students, teachers, and educational developers to make their own versions of these learning experiences. The cases present a short background and purpose, the community, tools, and activities, and point to further information and resources.
- To ensure knowledge and skills transfer among courses and teachers within Arctic Biology at UNIS, we have designed an **AB toolbox** as a blueprint course on CANVAS that summarizes skills and knowledge commonly used. These comprise e.g., practical skills and dissemination skills for students, as well as teaching techniques.
- bioCEED staff led the work to furnish new **student-active learning spaces** at UNIS, which opened in 2022. These learning spaces are an important and necessary contribution to improve the student's learning environment, generic skills development and student-active research opportunities.
- The **BIO Student Poster Symposium**¹¹ is now an established event on campus every semester. The poster symposium is part of the assessment in all participating courses. In 2022, 6 courses participated in the spring, and 6 courses in the fall event. More than 300 students participated with individual posters or group posters. For the first time we had included a course from another department (GFI) and this will continue in 2023. All posters are available at [bioPITCH](#).
- bioCEED UiB built on FieldPass¹² (Box 1) innovations and developed a course-specific **virtual field guide**¹³ (VFG) for the Palaeoecology course at BIO. A second VFG for the

⁹ https://bioCEED.uib.no/dropfolder/bioCEED/bioCEED_Effektrapportering_2014_2022.pdf

¹⁰ <https://bioCEED.w.uib.no/resources/toolkits/>

¹¹ <https://bioCEEDnews.w.uib.no/2022/12/07/new-records-for-the-student-poster-symposium-at-bio/>

¹² <https://www.unis.no/project/FieldPass/>

¹³ <https://bioCEED.w.uib.no/virtual-field-guides/>

introductory course BIO102 – Organismal biology II is currently under development to be completed during spring 2023.

FieldPass - *Development, testing and evaluation of tools and assessment forms that promote constructive alignment in field and lab teaching.*

FieldPass is a three-year project funded by Diku AKTIV (now HKdir) and extended one year due to delays related to the corona pandemic. The project is run from UNIS in collaboration with UiO (Skolelaboratoriet), UiB (BIO, Department of Education), University of Otago and with the involvement of bioCEED and iEarth. The project aims to develop and evaluate new ways to prepare and assess practical skills and general competences learned through field and lab activities. Virtual field guides (VFGs), certification- and reflection tools have been developed, tested and implemented across institutional courses, programs and across different fields of education (biological -, earth- and physical science, in total 24 courses, 937 students). The project and the results are shared through several workshops and presentations internally (UNIS, UiB and UiO) and through national and international conferences (Læringsfestivalen - NTNU, HK-dir conference and Evolving molecular bioscience education, UK and the upcoming MNT conference March 2022). Two papers are submitted for peer-review. Digital tools as VFGs and videos are shared through <https://360.learningarcticbiology.info/>, and linked to more general portals like <https://www.learningarcticbiology.info/> (for biology), the Svalbox page for geology. The project has its own homepage (FieldPass - Home (unis.no)) and the results from the project are also shared through this site.

[The full impact report to HKdir for FieldPass](#)

Box 1 FieldPass

- Several courses have, with bioCEED support, been redesigned and developed. Some examples:
 - BIO101 has tested forms of student active learning and team-based learning, redesigning the course from traditional lectures and labs to student active seminars and lab-activities. This work will be presented at the 2023 MNT conference.
 - BIO102 has continued developing student research skills through collaboration with local stakeholders and has changed from exam to portfolio assessment—leading to better alignment with the intended learning outcomes for the course.
 - bioCEED collaborate with Informatics to implement a sense-of-belonging intervention in INF100 (introductory course for all STEM students). This intervention, which responds to disparities identified in surveys, replicates work from Cotner et al in the US, and is the first use of this intervention in Europe.
 - bioCEED collaborate with Thomas Gjesteland (MATRIC) on an assessment intervention in introductory Math at UiA.
 - FieldPass has had an impact at both UNIS, BIO-UiB and UiO, ensuring better alignment to stated course learning outcomes and the developed tools and results are shared through different channels (see Box 1).
 - The scientific writing course was partly implemented in AB-201 and AB-329/829 courses, aiming to improve report writing skills at both BSc and MSc levels. Results were evaluated with a questionnaire and are part of a SoTL project in the UNIS pedagogy course.
 - The AB-202 course (more student active learning and development of assessment part), AB-203 course (overall course structure) and AB-332/832 course (student reflections on own learning) are incorporating changes (in brackets) that have been facilitated by bioCEED.

- We are **exceedingly proud of our excellent PhD students** Anja Møgelvang and Marius Ole Johansen. Both have now submitted their PhD theses.
 - The PhD thesis on cooperative learning by Anja Møgelvang has now been approved and the defense will take place on [March 14th](#). The PhD thesis contains a synopsis and three published articles and is called “Cooperative Learning in Undergraduate STEM Education: Applications and Outcomes”. The findings show that cooperative learning methods can be successfully implemented and lead to positive psychosocial outcomes among STEM students.
 - Marius Ole Johansen’s PhD thesis (Effects of autonomy and control on student motivation and functioning in higher education) highlight the importance of providing an autonomy supportive educational context for students. By acknowledging and taking the underlying processes that affect student motivation into account, teachers and instructors can promote autonomous forms of motivation which can increase learning, persistence, engagement, and vitality in students. The results from these studies further expand upon the knowledge as to what affects student motivation and functioning, and the diversity of the methodological approaches to the different studies provides strong support for the validity of the overall hypotheses.

ReDesign of BSc biology – structured redesign model meets reality

Student active research and generic skills in redesigning the BSc biology curriculum is a three-year project funded by Diku-AKTIV (now HKdir), and extended one year due to delays related to the corona pandemic. The project is a collaboration between bioCEED, Department of Biological Sciences (BIO) and the UiB Learning Lab, we are testing and amongst top aims for this project is to test and apply the Learner Centered (re)design Module (developed by Texas A&M) in a Norwegian higher education context. The project has engaged all teachers at BIO in the development of new intended learning outcomes across the curriculum, along with for BSc Biology, and in discussions about teaching, learning and assessment in the BSc program. The project plan was altered the program plan due to pandemic restrictions, with an emphasized digital teachers meetings and generic skills training in online courses. Our June 2022 Teachers Retreat focused on ReDesign, resulting in a revised curriculum map that aims for is developed, ensuring better alignment in and between courses in regards of content, skills training, pedagogical approaches, and assessment. Through ReDesign, we are also supporting other developments such as of new forms of assessment, teacher meetings, the twice-yearly student poster session, the development of new student course evaluations forms (CALEQ) and the student journal, Bikuben.

It is also an aim to implement bioCEED innovations and resources in courses and program to ensure changes are integrated in the program and department. This project is supporting the development of new forms of assessment, e.g. student poster session and the student journal.

[The full impact report to HKdir](#)

Box 2 Redesign

- We have been involved in **Open Science** initiatives, largely following our work documented in Strømme et al (2022) on perceptions of Open Science among participants in the Living Norway symposium, 2021. Findings show that many do not engage in Open Science in large part due to a lack of education about Open Science practices and principles. In response, bioCEED provided support for **a course on Open, Reproducible, and Transparent Science in Ecology**¹⁴ at the Biological Research Station (Finse, Nov 2022). The course was a collaboration between bioCEED, GBIF Norway and Living Norway with teachers from NINA, NTNU, UiO and UiB. The course targeted PhD students and offered hands-on training, skills and knowledge on Open Science, data collection, data handling,

¹⁴ <https://bioCEEDnews.w.uib.no/2022/12/13/open-reproducible-and-transparent-science-course/>

data standards, data repositories and publishing, reproducible workflows, and best practice in data analysis.

- BIO BSc program board implemented a new course evaluation questionnaire as a standard quality assurance tool for courses at the department. The questionnaire was developed by Christian B. Strømme and Jorun Nyléhn in collaboration with colleagues at bioCEED and BIO. This questionnaire enables evaluation of constructive alignment and perceived generic skill development in students' course experiences. Serving the needs of the project ReDesign (Box 2), as well as educators and staff at BIO, for information on educational quality and associated development, the questionnaire includes the validated *Constructive Alignment Learning Experience Questionnaire*, scales from the *Course Experience Questionnaire* (CEQ) and open-ended items to capture additional student feedback.
- The student led projects bioSPIRE and UNISprout continue to offer students short-term practical involvement in research groups and scientific projects.
- The concept of biORAKEL in Bergen have been developed and taken in use at UNIS – [UNISoracle](#) was arranged 14 times during fall 2022 for BSc students at the AB-department.

DEVELOP – Developing evidence-based mentoring for better STEM work placements

DEVELOP is a three-year project founded by DIKU Økt arbeidslivsrelevans i høyere utdanning (now HK-dir).

Through DEVELOP¹⁵, a multi-institutional (UiB, UiO; UiT, HI, NORCE) team of students, instructors, work-practice supervisors, course teachers and administrators are learning more about what our students' supervisors, or hosts, need to be effective mentors for our students. We have led three focus groups in Bergen, Tromsø, and Oslo, and will be using information from these discussions to create online modules for future work-practice hosts. These online training modules will enhance the host competences as mentors by addressing the issues they raised in the focus group interviews, and in turn will improve the student experience and increase student learning in practical courses.

Follow developments at the [project website](#). [The full impact report to HKdir](#)

Box 3 Develop

bioCEED has a well-developed and ambitious outreach strategy ([described in previous reports](#)), that describes who, how, why, and what we will communicate to different audiences and through different communication channels. Outreach is also key outcomes and assessment criteria of many the specific actions in Focus areas 1-3. Thus, our fourth focus area is **outreach**, which includes several types of dissemination to educate hundreds of critical thinkers who will take 21st-century knowledge and skills to their future communities. Much of our outreach has been presented elsewhere (see Appendix 1-2), and includes our newsletter¹⁶, our social-media presence, several manuscripts published and in progress in the peer-reviewed literature, presentations across Norway and beyond (see Appendix 2), and the bioCEED Teaching and Learning Toolkits¹⁷. In sum, the impact of bioCEED continues to grow, reaching our communities and our colleagues in higher education--beyond biology, and beyond Norway.

Our outreach activities are summarized in Table 2 and details can be found in Appendix 2.

¹⁵ <https://dvlp.w.uib.no>

¹⁶ <https://bioceednews.w.uib.no>

¹⁷ <https://bioceed.w.uib.no/resources/toolkits/>

Outreach summary			
Format	Previous	2022	Reference
Scientific publications	36	7 (+6)	Cristin.no, bioCEED.no
Conference presentations/papers	70	11	Cristin.no
Invited presentations / talks	125	50	Cristin.no
Master theses	7	2	
bioCEED seminars, workshops, courses	>109	22	Appendix, bioCEED.no
Media (op-eds, interviews, magazine articles, podcasts etc.)	61	2	Cristin.no, bioCEED.no, nokut.no
Platforms	18	+3	bioCEED.no
Student meetings/seminars	>85	>25	bioCEED.no
biORAKEL, UNISoracle, unisBREAKFAST	>95	>28	Mitt.uib.no, bioCEED.no

Table 2. Summary of dissemination output. Previous works are reported in CRISTIN/see annual reports 2014-2021. 2022 details in Appendix 2.

In 2023, our final year as an SFU, we strengthen our team and efforts towards documentation, evaluation and dissemination of bioCEED outcomes and innovations, through

- i) *low threshold and open “how to”-online information and resources* (e.g. The bioCEED Teaching and learning Toolkit¹⁸, bioCEED News¹⁹, and revising and improving information for students²⁰ about our offers and resources to build research skills and gain research experience)
- ii) *disseminating outcomes and results from our educational research* in scientific publications and presentations at teaching and learning conferences
- iii) *supporting arenas for collegial sharing and competence building* (eg. Initiating new seminar series in collaboration with iEarth and Pedagogical Academy, bioBERG research group)
- iv) *documenting impact of bioCEED* through analysis of data from our years of operation (e.g. development and change of teaching methods used in biology courses, outcomes for students, development and change in degree of research based education, staff involvement and accomplishments etc).

Expected *impact* depend on the intended audience and the format of the dissemination. We strive to stay conscious about this, tailoring the format to the audience. This is sometimes challenging, as *impact* can be open to interpretation and look very differently depending on what perspective you take. It is also challenging to separate *impact of dissemination* from other impact (see Result and effect report submitted 1 Feb 2023).

Priorities 2023

The expectation for the coming year is to continue according to plan (Action Plan 2019-2023), and at the same time be flexible enough to take the opportunities that come along. Naturally, this being our last year as SFU, there will be a need to adjust activity (and budget) to reach the goals in the Action Plan. Important priorities in 2023 are to:

¹⁸ <https://bioCEED.w.uib.no/resources/toolkits/>

¹⁹ <https://bioCEEDnews.w.uib.no/>

²⁰ First version of student info page: <https://bioCEED.w.uib.no/resources/explore-bioCEED/#norsk>

- **Ensure sustainability** for the activities and resources that are currently relying on bioCEED support (e.g., digital learning platforms and tools, professional development courses, and several externally funded collaborative projects). Many bioCEED initiatives have become formal parts of BIO and UNIS and are assured near-term sustainability. For example, bioCEED has contributed to the development of courses that support students during work-practice experiences and research experiences. These are now part of the curriculum, with dedicated resources. However, we are concerned about the future of many of our activities and projects. To that end, we are discussing with leaders across the institutions our ideas for bioCEED's future. We have generated three different options for discussion at UiB—a simple model, a medium-sized model (Fig. 4), and a large model—for our future. The extent to which these plans are feasible, is given the current economic situation unclear.

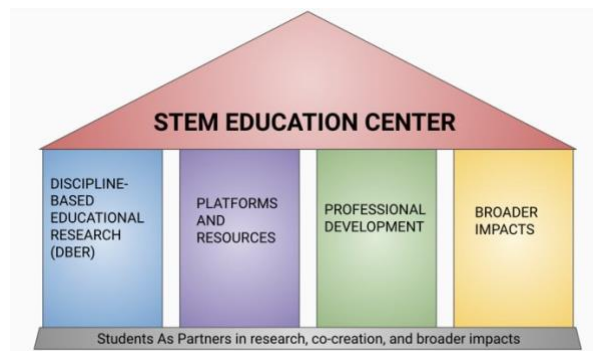


Figure 4. In the medium-sized model, bioCEED would be transformed into a STEM Education Centre, housed at the faculty level and involving participation from each of the departments. The STEM Education Center would continue to support cross-disciplinary DBER and SoTL efforts, while scaling up existing platforms and resources to serve a broader community, extending professional development courses and workshops to reach across the faculty, and providing assistance for our colleagues seeking external funding.

- **Secure continued activity in** educational development and discipline-based educational research, through seeking external funding and local commitment to support key staff and collaborations. bioCEED staff and collaborators, are actively seeking external funding. All efforts of securing external funding are in line with our vision and will contribute and add to bioCEEDs core center plan. Proposals submitted to NFR in 2022:
 - Test Anxiety: Rethinking Assessment in Introductory STEM (TARA), PI S. Cotner
 - Mobile INtegration or Distraction: Understanding the motivating, distracting, or educating roles of technologies in higher education (MIND), PI Lucas Jenø
 - Open (Undergraduate) Research Systems (OURS), PI Christian Bianchi Strømme
 Further plans include HKdir AKTIV (call opens June 2023) and other relevant calls.
- **Document, evaluate and disseminate** the impact of our work (see above under outreach). To this end, we are strengthening our team with two researchers in 2023 (Anja Møgelvang and Marius Ole Johansen). They will increase the impact of bioCEED by documenting our work in future reports, toolkit entries, and publications. Under the supervision of S. Cotner, Ruben Thormodsæter will start his PhD in education in 2023. We will also hire additional student partners to draw more impact from our ongoing work and student partner projects. Further, we will strengthen our team with communication resources to share bioCEED results, impact and innovation with a broader audience.

These priorities rely on bioCEED team members, but also our institutions (UNIS and UiB). The financial situation makes it difficult for us to secure a definite commitment at this stage.

Financial account and budget for the current year can be found in the Appendix (Appendix 3, Accounting 2022, budget 2023).

Appendix 1 Focus area and action report 2022

Focus area 1: Learning culture and educational leadership

The development and promotion of a **collegial learning culture**, based on SoTL and inspired by the research culture, is a major success and impact of bioCEED.

Specific actions are described and monitored through our Phase II Action plan for 2019-2023. Table 1 below shows the actions, audience, targets set in 2017 (traffic light coding; red: little or no progress, yellow: progress ok, red: completed or progressing according to plan), a summary of progress 2019-2021, activity and progress in 2022, and (new) plans for 2023. A detailed overview of outreach and outputs can be found in Appendix 2. If you follow the links in the text, you will find more information from our web pages or newsletter. We recommend that you do (that is where all the fun lies). Actions from the original Phase II action plan have been revised to include a broader range of collaborators activities, audiences, and potential outcomes (applies to A2, A3, A4, A8).

Table 1. Learning culture action plan			
	Targets	Progress	2022 actions and 2023 plans
A1. Offer project funding and support to stimulate collegial SoTL-based teaching development (<i>Biology educators locally / nationally</i>)			
	Projects completed	(15)	
	Innovations implemented	(>10)	
	Outcomes and impacts documented	(>5 papers)	
		2022	<ul style="list-style-type: none"> • The student-led conference on Polar Environment (SCOPE) (student project UNIS, PI Anne Mol, bioCEED and iEarth) was run for the second time with great success with 75 participants over two days. The conference is an arena for networking and creating a safe place for students to present their research work. This year students from Svalbard Folkehøyskole were attending with presentations as well, and the conference adds on a possibility to engage and motivate students from secondary education within science. • Going BIG: a spatial grid as basis for the Bjørndalen field laboratory (INITIAL). In INITIAL we aim to establish a spatial basis for the terrestrial part of the ecosystem in the Bjørndalen Field Laboratory, involving several organism groups and abiotic factors. Courses will have access to data and contribute their own, while course alignment will become a feasible and straight-forward process. In 2022, we started this project by establishing a spatial grid of long-term monitoring vegetation plots, stretching across various topographies, and vegetation communities. • Escape room (PI Ruben Thormodsæter) successfully developed implemented. The Escape room is being used in biology courses at BIO and are being developed and adapted to increase relevance for BIO courses even more. • The project Glacial microbiomes - in light and darkness (GLAD) has been finalized in 2022. GLAD aims to align the two courses Arctic Winter ecology (AB329/829) and Arctic Microbiology (AB327/827) run in winter and summer, both studying cryoconite on Foxfonna glacier. Real-time DNA sequencing and coordinated sampling was successfully implemented in winter and summer 2022 when courses ran for the first time after Covid. Thus, future student courses can build on this established database across seasons. • A bioCEED mini-grant also funded mobility for Robin Costello, a postdoctoral research from Auburn University. Together with Sarah Hammarlund (funded through an iEarth mini-grant), Robin collaborated with Sehoya Cotner and colleagues at iEarth to survey students about their sense of belonging and test anxiety in introductory-level STEM courses at UiB. This work resulted in one manuscript that is currently under review, two upcoming presentations at the MNT meeting in Stavanger in March 2023, and one manuscript in preparation (to be submitted summer 2023).
		2023	<ul style="list-style-type: none"> • SCOPE – will continue in 2023 run by master and PhD students as part of duty work to better maintain predictability as well as to enhance institutional implementation. The event will also be implemented in bachelor courses and used as an arena for bachelor students to train and present ongoing student course projects in a more formal setting. • INITIAL will continue also in 2023 developing the grid monitoring vegetation plots further. The vegetation grid will be taken into use of AB-329/829 and AB-201 courses in 2023. • New application for student worker (UiB) focusing on sustainable education and SDGs currently under consideration.

<p>A2. Develop collegial fora and a SoTL culture at our host institutions in collaboration with the Pedagogic Academy and other relevant units and partners <i>(Biology educators locally, MN Faculty/UNIS/UiB)</i> Old text: work with Pedagogical Academy to develop collegial fora and a SoTL culture at the faculty level.</p>		
	Active and visible bioCEED and Pedagogic Academy Staff participation in fora (>40/yr)	
		bioCEED hosts and organizes collegial fora at our host departments (e.g., BIO100-club, teacher’s meetings, Teachers retreat), our institutions/faculty (e.g. seminars, Learning forum) and beyond (conferences, seminars, workshops, presentations). An overview can be found in the appendix.
	2022	<ul style="list-style-type: none"> • Learning Forum 2022 – Education for Sustainability and Digital Tools, with broad contribution from bioCEED. • Digital teacher meetings, BIO100-club, (re)design core team • Teachers retreat in June and November. • bioCEED contributions to Mat.Nat Faculty Teachers Retreat (see appendix)
	2023	<ul style="list-style-type: none"> • Learning Forum 2023 • Teachers retreat 2023 • New seminar series with iEarth and Pedagogical academy • bioCEED projects will be presented at UiB Learning Conference
<p>A3. Develop and offer courses and opportunities for professional development for educators at different levels (TAs, PhDs, Tech/Admin, Teachers), in collaboration with the University Pedagogy Unit and other relevant partners <i>(Partner institution educators)</i> Old text: In collaboration with the University Pedagogy Unit, develop courses for educators at different levels</p>		
	Courses developed, evaluated and implemented (4) Good participation (10/course/yr)	
		Courses developed, evaluated and implemented: Teaching and Learning in Biology/STEM (MNPED660), TA (teaching assistants) course (UNIS+BIO), Pilot course: Leading Educational Change ,
	2022	<ul style="list-style-type: none"> • bioCEED staff (Holtermann) contributed to the development of the new course module on quality in education for education administration at UiB; KUSK – Modul 5 Kvalitet i utdanning, and taught a session on student evaluation of teaching. • TA course @MN-UiB - beyond BIO, to initially include chemistry. Our hope is to use this as a “proof of concept,” and then discuss further expansion with additional departments in the faculty. • TA course UNIS: The 2nd 3-day hands-on TA course "Teaching and Learning course" was successfully run March 2022. The course was primary offered to PhD students across all scientific departments but also open to MSc and Postdocs. The course is led by Ivar Nordmo and UNIS teachers and is a collaboration with iEarth. It consists of 4 parts on central theories and concepts of learning, presenter vs. facilitator role, written feedback and field learning. • The course Teaching and Learning in STEM, MNPED660, at UIB/UNIS with 21 participants from 7 departments, started in 2022. • The joint bioCEED and iEARTH course Leading Educational Change through SoTL (LEC) course was concluded in 2022. 19 participants from 4 institutions completed the course (5 ECTS). The participants completed 7 group projects. Several projects will be presented at MNT2023. The course concept was presented at EuroSoTL2022 in Manchester.

			<ul style="list-style-type: none"> PhD teaching hours: bioCEED with Academic Affairs and Scientific staff at UNIS have worked to create a common institutional duty work system at UNIS to improve the allocation of PhD teaching hours within the 25% duty work part of their four-year PhD position and professionalize the use of the teaching resource that PhDs represent. A policy document and an accounting system were implemented in 2022 at UNIS and taken into use.
		2023	<ul style="list-style-type: none"> TA course UNIS: The course will run during spring 2023 but in an extended version lasting for 5-7days with focus on field teaching. The course will be developed into a UNIS-UiB Field Teaching Assistant Academy towards a national FTA course and the project will be led by iEarth and in collaboration with bioCEED. A final revised course will be delivered during spring 2024. PhD teaching hours: The duty work system will be evaluated during 2023 to see how well it is integrated and if it needs adjustments. Collegial project Course (MNPED660), 2nd semester. TA course @MN-UiB – continue and expand. LEC course projects and LEC course concept presented at MNT conference 2023.
A4. Document and research impact of educator course participation and professional development on teaching practice and student outcomes (HigherEd internationally) Old text: Research impact of educator course participation on teaching practice and student outcomes old text Based on bioCEED projects, organize and contribute to workshops and research on SoTL culture development			
	Conference presentations (6) Published papers (2)		
	A SoTL project documenting and assessing the Collegial Project (MNPED660) course has been conducted and a paper (see appendix) presented at Conferences. A study documenting and assessing outcomes of Learning Forum Sharing session has been submitted for review. A SoTL project mapping and analyzing learning outcomes against course content was conducted (MNPED660 course project).		
		2022	<ul style="list-style-type: none"> Paper on Learning Forum Sharing session in review. Also presented at EuroSoTL2022. Paper on Virtual Field Guides in review. LEC course concept presented at EuroSoTL2022.
		2023	<ul style="list-style-type: none"> Publish papers and present at conferences. Paper on collegial project course (MNPED660) to be submitted to NJSTEME. Paper on microscope certification will be submitted.
A5. Contribute to develop and assess impact of educational leadership (Partner institutions, at all levels)			
	EdLead training module(s) developed EdLead has clear role.		
	bioCEED is represented through our host departments in the national body for biology (Nasjonalt fagråd for biologi). We collaborate with experts in educational leadership, eg. SFUs and other relevant units, and we have tight links the Centre for Engineering Education at LTH.		
		2022	<ul style="list-style-type: none"> Shared experience from the Leading Educational Change- course, both participants project (7 projects) and the course itself Nasjonalt fagorgan for biologi 2022: Steve Coulson continued as an ordinary member of the national expert body for biology. bioCEED was invited to the spring meeting in March and continued to give input to the UHR funded project through 2022.

			<ul style="list-style-type: none"> SFU-collaboration: 2022: Planning a collaborative assessment PhD project with MATRIC, Planning a collaborative equity-related project with CELL. Joint seminar series with iEarth (and more). NJSTEME workshop From Practice to Publication: An authoring workshop for the Nordic Journal of STEM Education: hosted 20 of our colleagues from Norway and Sweden in an authoring workshop, in an effort to revive NJSTEME activity, develop more reviewers for future submissions, and encourage more of our colleagues in the STEM disciplines to consider contributing to the STEM-education literature. Cotner has been involved as an Associate Editor with the Nordic Journal of STEM Education (NJSTEME)
		2023	<ul style="list-style-type: none"> Continue developing collaboration through participation, leadership and joint projects.
A6. Contribute to the development and implementation of educational merit systems (HigherEd in Norway)			
	Process participation (3) Institutional collaboration (2)		
		bioCEED has been essential for the implementation of pedagogical merit systems at UiB, and have contributed considerably to building knowledge and supporting the development and implementation of such systems across Norway. BioCEED/CEE PhD researching merit systems.	
			<ul style="list-style-type: none"> Continued collaboration and support with Pedagogical Academy. Contributions to workshops, meeting and seminars on merit systems. BioCEED staff (O.Førland) lead the work with evaluating the Excellent Teaching Practitioner scheme at MN-UiB.
			<ul style="list-style-type: none"> Evaluation of ETP scheme at MN-UiB.
A7. Develop a research project to assess role of teacher culture for educational quality in HigherEd (NFR Finnut programme)			
	Project developed, funded, and successfully completed		
		PhD project started, but no project funding.	
		2021-2023	PhD project (very slowly) progressing.
A8. Based on bioCEED projects and competence, organize and contribute to workshops and research on SoTL culture development (Teachers, students, HigherED internationally)			
	Workshops arranged (>3) Well attended (>30 participants)		
		See appendix and workshops related to specific Actions. See A1-6.	
		See Appendix 2 for an overview and see Outreach output summary.	
		Continue spreading, documenting and researching.	

Focus area 2 & 3: Innovative teaching and Practical training

An important priority in Focus Area 2 has been to mainstream bioCEED innovations into the formal structures and processes at our host institutions. This is essential for broad, lasting and sustainable local impact, and it requires moving beyond the project phase and the ‘coalition of the willing’ to involve staff and structures at the broader departmental and program level. This links directly to the work within focus area 3 where students should be exposed to a wide range of learning experiences. bioCEED especially develop authentic learning experiences occur when students engage with ‘real’ biology in the field or lab, when they train in performing and applying biological skills and competences in relevant contexts, or when they participate alongside ‘real’ biologists working in research or in the workplace.

Much of the development in these Focus areas are organized under some large, overarching projects (see Table 2, A9-A14, and Table 3). Researching, assessing, and documenting teaching innovations is an important part of these Focus areas.

Specific actions are described and monitored through our Phase II Action plan for 2019-2023. Table 1 below shows the actions, audience, targets set in 2017 (traffic light coding; red: little or no progress, yellow: progress ok, red: completed or progressing according to plan), a summary of progress 2019-2021, activity and progress in 2022, and (new) plans for 2023. A detailed overview of outreach and outputs can be found in Appendix 2. If you follow the links in the text, you will find more information from our web pages or newsletter. We recommend that you do (that is where all the fun lies). Actions from the original Phase II action plan have been revised to include a broader range of collaborators activities, audiences, and potential outcomes (applies to A15, A19, A21, A24).

Table 2 Innovative teaching

	Target	Progress	2022 actions and 2033 plans
A9. Wider use of platforms across major courses, as a backbone for aligned bioSKILLS training across programmes (Teachers, students)			
	Courses that use the platforms	>10	
	Staff and students contributing to develop them	>50	
		Developing the bioSKILLS platforms have been at the core of bioCEEDs development work from the start. The platforms bioST@TS , bioWRITE , bioSKRIV and bioPITCH are developed and implemented in several courses at BIO and UNIS. They are also freely available for other educators and students. Staff and students contribute to the continued development of the platforms. bioSKILLS are central to several ongoing projects (e.g. ((re)Design).	
		2022	See A10.
		2023	Ensuring sustainability and usability of platforms.
A10. Develop and implement new bioSKILLS modules for key subject-specific and transferable skills (Teachers, students)			
	Modules developed	>4	
	bioSKILLS is backbone of skills training through curriculum		

		See platforms. Currently 4 modules are (fully, although not definitely) developed in bioSKILLS, in addition to a range of other resources that fill other purposes and supplement bioSKILLS (see A11). bioSKILLS. bioST@TS now gathers teachers from NTNU, UiT and BIO who collaborate to develop collective teaching materials that are relevant to virtually any teaching in biology.
	2022	<ul style="list-style-type: none"> • bioPITCH showcases all student posters presented at the biannual Student Poster Session (BIO, UiB), giving students i) practice in outreach and ii) a scientific product from coursework they can link to cv/documents. • bioSPIRE has continued offering BSc students the opportunity to join a local research project and gain both skills and experience with practical biology. Since 2017, bioSPIRE has given 63 students access to 42 projects, and has generated nearly 900 hours of practical training and involvement in the local research community. • BioST@TS: core team has worked on a series of new digital books introducing the use of R/RStudio to 1) manage, organize, analyze and visualize data, 2) write and design reproducible documents, 3) share and collaborate in GitHub, etc. The books are available on the website. In parallel, the team has collaborated with teachers to develop course-specific resources (i.e. tutorials illustrated with course datasets that students use actively as part of the teaching activities). We have published 5 pages in the context of practical teaching in microbiology (BIO101), comparative physiology (BIO104, 3 items) and behavioural ecology (BIO241). • The Learning Arctic Biology platform has been redesigned inspired by the websites of "Store Norske Leksikon". All text-based content now follows the same design rules, and templates are included that can easily be inserted by users. We added new texts on with vascular plants, invertebrates and micro-organisms in the Arctic. The platform links out to other useful digital tools such as "Virtual Field Guides" and "ArtsApp". • The ArtsApp Svalbard flora project was formally finalized during 2022. It will continue to develop also through 2023 with a graminoid key which is planned to be launched before summer 2023.
	2023	Further developing content for platforms. Ensuring sustainability and usability of platforms.
A11. Develop joint virtual and physical model systems to support training key skills and competences (Biology educations, teachers, students)		
	Develop model systems (>3) Implementation into courses (>6)	
	See A9 and A10, as well as projects BIG , FieldPass , Learning Arctic Biology Platform , VFG , bioSKILLS , VtG , ArtsAPP , (re)Design .	
	2022	<ul style="list-style-type: none"> • FieldPass (Box1) have been testing tools for teaching and assessment. We have continued to develop and added new virtual field guides (VFGs) to our Learning Arctic Biology platform. A workshop on How to utilize virtual field guides in teaching was given to staff at UNIS. A presentation was given at the HK-dir conference (Utdanningskvalitet og digital omstilling) in April 2022. A workshop on how to create virtual field guides was given at UIO. A workshop was given to Grid-Arendal on the FieldPass tools. A certification protocol for microscopy is integrated into beginner's courses at UiO, BSc courses at UiB, and at BSc, MSc and PhD courses at UNIS. A certification protocol for practical field skills have been developed, tested and evaluated in two courses. • Building on FieldPass, BIO has developed a virtual field guide including teaching videos as supportive teaching material in the Paleocology course BIO250. Students use the VFG for fieldwork preparation and follow up. Course leader Anne Bjune created a pedagogical exercise (group work) for students to contribute to the platform. Students were given the opportunity to design and publish digital contents such as virtual information posts describing local flora, interesting findings in the samples collected, and relevant notes about working conditions in the sampling area. • Since 2020 bioCEED have been involved in a project group working with the use and the furnishment of the student learning spaces at UNIS. The new learning spaces were officially opened in September 2022 by the UNIS director increasing the study areas for group work and collaboration.

			<ul style="list-style-type: none"> Field-based study systems for course-based undergraduate research: First iteration of student-led research projects in the course BIO102 <i>Organismal biology 2</i> (10 ECTS). Development of three land-based ecology research projects added to the list projects that students can choose from. Resulted in three distinct student reports and associated data series. These projects were developed in collaboration with students in the course, bioCEED personnel including student partners, course teachers and the Heathland Centre staff at Lygra. Course development was informed by successful course-based student research projects and other institutions as reported in available literature.
		2023	<ul style="list-style-type: none"> In the conclusion of the FieldPass project (spring 2023) we will work to finalize the instructional videos as well as the VFGs. Three master students in Natural Science with Teacher Education from UIO are currently doing their master thesis on certification, virtual field guides and reflection tools. A paper on certification on practical lab skills will be submitted to Nordic Journal of Stem Education. We will also present our field certification tools at the MNT conference. Two papers on reflection tools are under development and will be submitted. Learning spaces at UNIS: An evaluation/research project of the use of the learning space and how it supports the learning processes will be planned and conducted in 2023 together with Ivar Nordmo, UiB. The room will be finalized with internet equipment during spring 2023. We are now working on a new VFG specific for BIO102 – Organismal biology II, the introductory course in BIO’s bachelor programme in biology that takes over 100 bachelor students on field for the first time in their curriculum. We expect to have it ready to use for the upcoming semester (Fall 2023). Field-based study systems for course-based undergraduate research projects will be continued in during Autumn 2023 and associated to repositories for data storage and creditation of involved students as data gatherers.
A12. Develop program-wide ILOs for key subject-specific and transferrable skills (Programmes, teachers, students)			
Track change in course and programme ILOs			
See projects FieldPass , bioSKILLS , VuggetilGrad and (re)Design .			
		2022	<ul style="list-style-type: none"> Development of programme-level ILOs, development of rubrics based on ILOs and alignment in BSc Biology UiB (Box 2). New ILOs have been developed through systematic consultation with faculty, a curriculum map has been made to increase alignment between courses for content, skills training, competences, assessment, and pedagogical approach. Workshops for teachers retreats and seminars (see Box 2). The student active research project VuggeTilGrad (Thon-stiftelsen) was concluded, and outcomes include several TL Tool Kit cases, curriculum mapping of research experiences (to inform course development), as well as development of course based and outside course research experiences for students. FieldPass tools developed, tested and implemented in courses across different institutions (UNIS, UiB, UiO). (see Box 1)
		2023	<ul style="list-style-type: none"> Redesign: Further work on course ILOs in alignment with program ILOs is planned.
A13. Develop quality assurance aligned with the above (Programmes, institutions, teachers, students)			
Track change in course and programme ILOs, focusing on skills and alignment			
See A12 and projects FieldPass , bioSKILLS , VtG , and (re)Design .			
		2022	<ul style="list-style-type: none"> TBL training and implementation in BIO101 (UiB) supported by bioCEED staff, workshopping the curriculum redesign of the course to adapt to more active learning through TBL. Workshops were supported through UHR-MNT funding. Project (re)design of BSc Biology targets alignment and skill training in the programme (see Box 2) . The new course survey questionnaire has been implemented as a standard student course evaluation questionnaire for courses associated with the BSc in biology at BIO, with validated survey items from Constructive Alignment Learning Experience Questionnaire (CALEQ) and the Course Experience Questionnaire (CEQ). CALEQ was recently validated as a tool for inferring constructive alignment based on student feedback. CALEQ was translated to Norwegian Bokmål by Christian B. Strømme, Jorun Nylehn and Arild Raaheim.

	2023	<ul style="list-style-type: none"> • Redesign deliverables – end report and publications. • FieldPass deliverables – end report and publications.
A14. Stimulate educational innovation through project funding and support. Prioritize projects with students as partners (Biology educators and students locally and nationally).		
		Projects completed (>30).. With students as partners (>10) Innovations implemented (>15) Impacts documented (> 7 papers)
		Ref A1. <30 SoTL projects have so far been completed as part of Teaching and Learning in biology/STEM (Collegial Project Course, MNPED660), LEC (Leading educational change) over several rounds, leading to innovations being implemented (e.g. early versions bioSTATS, bioWRITE, Larvae incubator, TBL, VFG), and documented as papers, conference presentations and reports.
	2022	<ul style="list-style-type: none"> • ToolKit launched • Projects from LEC-course completed (7), documented and shared/published • bioHIVE and student partner deliverables and contributions (see report and A15)
	2023	<ul style="list-style-type: none"> • Announce small grants • Hire student partners. • Increased effort on documentation (ToolKit, Lessons learned, reports, publications). • Ensure sustainability and usability of platforms.
A15. Students as Partners. Include students in all research and development activities and projects. Include students in decision making. Ensure sustainability and learning outcomes and provide fair working conditions for student partners (Programmes, institutions, students) (Old text: Establish student panel to advise development of innovative teaching modules and curricula)		
		Targets to be defined by bioHIVE
		BioCEEDs student involvement and partnership approach have evolved over the centre period. This is excellently described in the podcast on student involvement by student representative Pernille Eyde Nerlie.
	2022	<ul style="list-style-type: none"> • The bioHIVE is active, and student partners (bioBEES) engaged in projects. (5 20% positions at bioCEED Bergen). • Student involvement in redesign core team • Bikuben Student Journal – first printed edition in 2022 • Student led projects bioRAKEL, UNISbreakfast, UNISprout, bioSPIRE continued. • UNISoracle started up at UNIS and is run by Master and PhD students. • BioSPIRE continues to offer bachelor students opportunities to join a local research group. BioSPIRE students actively contribute to selected research projects while learning the basics of practical biology with experienced peers. • SCOPE – The student-led conference on Polar Environment
	2023	<ul style="list-style-type: none"> • Present bioCEED model for student partnership at UiB Learning Conference • UNISoracle will be further developed in 2023 • UNISprout will expand its range, also including iEarth and the geology department • Create sustainable model for Bikuben.
A16. Researching the impact of innovations on staff and student attitudes, learning, and motivation (Teachers, students, HigherED internationally)		
		Improved educational outcomes (>5)

	<p>PhD (1) and master (4) theses Published papers (>5)</p>
	<p>BioCEED have a large portfolio of research projects that investigate student learning outcomes, motivation, teaching and assessment methods. bioCEED core team include researcher in professor, associate professor, post doc and PhD positions, as well as research assistance and support from admin and tech staff. Student partners, master students and bachelor students are also part of our research teams and outputs.</p>
	<p>2022</p> <p>See publications and other outputs in Appendix. See A7, A14, A16, A19.</p> <ul style="list-style-type: none"> • The PhD thesis on cooperative learning by Anja Møgelvang has now been approved and the defense will take place on March 14th. The PhD thesis contains a synopsis and three published articles and is called “Cooperative Learning in Undergraduate STEM Education: Applications and Outcomes”. The findings show that cooperative learning methods can be successfully implemented and lead to positive psychosocial outcomes among STEM students. • Marius Ole Johansen’s PhD thesis (Effects of autonomy and control on student motivation and functioning in higher education) highlight the importance of providing an autonomy supportive educational context for students. By acknowledging and taking the underlying processes that affect student motivation into account, teachers and instructors can promote autonomous forms of motivation which can increase learning, persistence, engagement, and vitality in students. The results from these studies further expand upon the knowledge as to what affects student motivation and functioning, and the diversity of the methodological approaches to the different studies provides strong support for the validity of the overall hypotheses. • 3 NFR proposals submitted (Cotner, Jenø, Strømme). • Kjetil Rundereim successfully defended his Master of Science (Teacher education) thesis investigating the difference between ArtsApp and ArtsOracle on upper-secondary students. The MSc thesis was written as part of the ArtsApp project. • Associate professor Lucas Jenø: Through the ArtsApp project, we are investigating the effectiveness of ArtsApp and technologies for increased motivation and learning. • Master students Tonje Ailin Lokøy and Nathalie Sortland in the Integrated teacher programme in science and mathematics successfully defended their joint master thesis on how students perceive relationships between key aspects of teaching and learning in BSc Biology courses in order to infer constructive alignment. The students were supervised by Jorun Nyléhn and Christian Bianchi Strømme and is associated with the project ReDesign. • Postdoc Christian B. Strømme: The new course evaluation survey questionnaire (see A13) was further applied to biology courses for the purpose of assessing teaching and learning practices ahead of planned study programme changes (see A12). Along with information obtained through the master student-led projects described above, gathered data inform ongoing educational development efforts described in A12. Taken together, the data will constitute the basis for the documentation for the ReDesign, including a manuscript intended for an international peer-reviewed journal. Data from CALEQ will be interpreted jointly with parts of qualitative data gathered and analysed by master students Lokøy and Sortland (see previous bullet point) for a co-authored manuscript intended for an international peer-reviewed educational research journal. • Postdoc Christian B. Strømme: Addressing how Open Science (OS) aspects are learned, understood and perpetuated among practitioners in ecology, we surveyed participants at the 2nd Living Norway Colloquium that was organized by the Living Norway Data Network in October 2020. The study was intended to inform higher education study programs in ecology and related domains by highlighting how OS is mainly practiced by researchers in those fields, as well as what they view are the main incentives and barriers to individual engagement in OS. The study employed a combination of qualitative and quantitative approaches from educational research and yielded a peer-reviewed article published in PLOS ONE.

			<ul style="list-style-type: none"> • Postdoc Christian B. Strømme: Undergraduate biology students at UiB contribute with land-based carbon data to the Bergen Municipality through a course-based student research project. Christian is investigating how this project and its outcomes are driven and perceived by the participants through a qualitative inquiry. This study will result in a peer-reviewed manuscript intended for educators and educational developers with an interest in making course-based undergraduate research broadly applicable and relevant. • Data collection on Student Poster Session/ student learning for improving student learning experience and develop understanding of the student learning. • Post doc Kseniia Kalian (FieldPass project) finished her data collection in 2022. Through her research she identified that dealing with uncertainties, making mistakes, being wrong and having enough freedom to exercise own agency as preconditions for reflection that promotes learning from experience, allows students to formatively assess themselves and can be taken into consideration by academic staff during summative assessment. Several workshops were held to share this new understanding and recommendations. During spring semester 2022 workshops were held in 3 courses: Arctic Atmospheric Boundary Layer and Local Climate Processes (AGF-350/850), Geomorphology (UiB) and Marine Arctic Biology (AB-202). From the latter course diaries and visualization data were collected. Reflective diaries and tools for visualization were also tested in Arctic Winter Ecology (AB-329) - with some alterations.
		2023	<ul style="list-style-type: none"> • Incoming PhD Ruben Thormodsæter is collaborating with Cotner’s EDU-STEM Network in the US, as network members participate in a multi-institutional study of test-anxiety mitigation—in this case, using <i>cognitive reappraisals</i> to reframe the anxiety students feel while taking high-stakes tests. Our hope is to replicate and expand this work via TARA at UiB and UiA. • Continue ongoing projects. • Data from Student Poster Symposium will be presented as a poster at the UiB Learning day. • Kseniia Kalian: Two peer-reviewed academic articles will be finished in 2023.
A17. Organize workshops on educational development at biological scientific conferences (HigherEd biologists)			
	Workshops arranged (>5)		
	Well attended (>50)		
	See overview under Outreach, Appendix and A8		
A18. Organize and contribute to workshops and research on innovative teaching (Teachers, students, HigherED in Norway)			
	Workshops in connection with Learning Forum, Teachers retreat, in addition to workshops on other institutions (14)		
	See overview under Outreach and in Appendix.		
A19. Research project on outcomes of student-active research and inquiry-based learning (Programmes, Institutions, HigherED)			
	Project developed and funded and successfully completed		
	See A16, publication list and outreach overview in Appendix, and projects FieldPass , VuggetilGrad , (re)Design .		
A19. PhD project on impact of learning and assessment tools on student learning and motivation (HigherEd Internationally)			
	Research papers (>4)		
	Conference presentations (4)		
	Guidelines developed		
	PhD project Marius Ole Johansen.		
	2022	Thesis submitted	
	2023	PhD defense and publications.	

Table 3 Practical training

	Target	Progress	2022 actions and 2023 plans
A21. Revise and streamline the work and research practice courses, and work to ensure all students relevant practical experience as part of their BSc programmes (Biology educations, teachers, students)			
Old text: Revise and streamline the practice courses as a compulsory part of the disciplinary BSc programmes			
		Practice integrated in all programmes All students have had practice course or module	
		An important focus has been to mainstream practice courses into the formal structures and processes at our host institutions. We work to ensure students are exposed to a wide range of learning experiences; especially develop authentic learning experiences as courses (e.g. BIO299, BIO298, AB-208, AB-207) or as modules in courses. Student numbers in the practice courses are increasing, and number of modules in courses are also increasing. bioCEED at UiB and UNIS during the center period have given 1335 students (units) practice or skills training opportunities (a total 24 105 days), in activities ranging from work practice courses, mentoring, research practice, research assistance and skills training. For staff and collaborators, 241 people have participated in cross-sectoral mobility (total 5266 days), as work practice hosts, through research and teaching mobility ad adjunct faculty.	
		2022	<ul style="list-style-type: none"> • Research practice in biology (BIO299, 29 students 2022):redesigned based on student feedback, and changes are implemented in 2022. ILOs now include training in outreach through blog and poster in addition to the research practice and report. Rubrics are developed to streamline the assessment and support the supervisors. All supervisors were invited to a dialogue meeting. • BIO298 Workplace Practice (23 students in 2022) in biology has added workplace hosts, giving more students possibility for workplace practice. The student blogposts are part of the course ILOs Hosts have been invited to focus group interviews for the DEVELOP project. • Due to limited resources, the practice course AB-208 at UNIS was not run in 2022. • Developed toolkit cases and evaluation of research practice courses.
		2023	<ul style="list-style-type: none"> • ToolKit on work practice courses • Document and publish results
A22. Develop and document ‘best practice of practice’ to enable transfer of experiences across disciplinary educations (Programmes, teachers, HigherEd)			
		A manual for ‘work placement for better learning in disciplinary educations’	
		The development and impact of the work practice courses have been documented through publications and shared in relevant foras.	
		2022	<ul style="list-style-type: none"> • bioCEED received HK-dir Arbeidslivsrelevans funding for «Developing evidence-based mentoring for better STEM work placements (DEVELOP)». DEVELOP partners had their official kick-off meeting February 2022. Developments are posted on project webpage: https://dvlp.w.uib.no/ (See box 3). • ToolKit on developing research practice course developed on bioCEED web page. • Supporting the establishment of research practice course at UiO by sharing all BIO299 resources and discuss experience. • Focus group interview with work placement hosts were conducted for DEVELOP (see box 3) • BIO298, BIO299 and DEVELOP has been presented on national conference for STEM study admin, and for the national GEO Praksis Forum conference.

		2023	<ul style="list-style-type: none"> • ToolKit entries on work practice course will be developed • Project DEVELOP (se box 3) will develop modules for work placement hosts based on focus group interview data collected • Through DEVELOP, admin staff at UiO, UiT and UiB are encouraged to collaborate on “best practice” for work placement courses, and disseminate • DEVELOP project and preliminary findings will be presented at the MNT conference in 2023
A23. Formalize network with partners in the private and public sector, staff, and students over work practice (Private sector, public sector)			
Regular communication, useful inputs, systematic collaboration over work practice			
BIO298 and AB208 continue network with hosts and Work practice host network meeting (IMR)			
		2022	See A22 and Develop (Box 3). DEVELOP met with project <i>Samarbeid on praksis i høyere utdanning</i> ved Fiskerihøgskolen/UiT to discuss possible collaboration.
		2023	Develop will strengthen and expand network. See A22. DEVELOP is collaborating with partners at HI, NORCE, iEART, UiO, UiT and UiB. Dialogue with <i>Samarbeid on praksis i høyere utdanning</i> ved Fiskerihøgskolen/UiT to be continued
A24. Establish a panel of end-users, staff and students to advise on biology curriculum development to meet society’s need			
Refer to A22, 23, 25, and 26			
This action has been re-imagined through a variety of projects (e.g. Redesign-project, students as partners, host meetings) and purpose-built networks and connections. The redesign core team is established to redesign the BSc biology, and consists of teachers, pedagogues, students and staff, and includes cooperation with the UiB Learning Lab.			
A25. Carry out bioCEED survey 2018 and 2022 (Programmes, teachers, students)			
Surveys completed and published Papers on change over time in student, staff, and sector experiences			
BioCEED Survey conducted in 2018. Data used in research and dissemination.			
		2022	<ul style="list-style-type: none"> • Area for improvement: 2018 survey lack comprehensive report.
		2023	<ul style="list-style-type: none"> • Use data and make report. • Ongoing study with data from bioCEED surveys of 2015 & 2018 applying to investigate probabilistic relationships between perceived structural, social, and psychological features that are predicted to affect relatedness, need satisfaction and perceived collaborative skills among biology students. • The project “Paths to dropout” employed data from the bioCEED-2015 and 2018 survey to investigate different motivational determinant that predicts students’ achievement and dropout.
A26. Research the impact of different forms of practice on staff and student attitudes, learning, and motivation (Teachers, students, HigherEd internationally)			
Improved educational outcome, PhD (1), MSc (1) theses, Published papers (>4)			
The project PRIME (including the very excellent PhD Torstein Hole Nielsen) documented and researched the impact of practice (see publications).			
		2022	<ul style="list-style-type: none"> • Develop, see A22. • Data on learning experience and outcomes of research practice collected.

Focus area 4: Outreach

Dissemination and outreach are important not only to promote bioCEED outputs, but also as a key part of the idea behind bioCEED. Our communication and dissemination strategy is broad, both thematically and regarding its aims. The activities have different audiences and scopes, ranging from local communication with our staff and students regarding practical pedagogical issues, to national and international communication aiming more to affect educational policy and society more broadly.

Table 4 Outreach

	Target	Progress	2021
A27. Develop bioCEED communication platforms; web page, bioSKILLS, newsletter, etc. (Teachers, students, HigherEd)			
	Platform content develops (10% yr) Relevant reach locally and externally		
		2022	<ul style="list-style-type: none"> • Newsletter – read it! It’s fun! The newsletter was redesigned in 2022 with a new layout to better promote our bioCEED stories. • Teaching and learning toolkit launched • Develop web page developed: https://dvlp.w.uib.no/ • See also Table 2 for platform development. • See appendix for Outreach.
		2023	<ul style="list-style-type: none"> • ToolKit developed, including Lessons learned-section.
A28. Contribute to scientific literature, public debate, and policy development vs. quality teaching and learning in HigherEd (Policy, society, teachers, students, HigherEd)			
	Scientific papers (>5/year) opinion pieces (10/year) impacts on policy (1/year)		
		2022	<ul style="list-style-type: none"> • See appendix for publications, op-eds and quality/policy work contribution.
		2023	<ul style="list-style-type: none"> • Scientific publications • Opinion pieces • Impact on policy • Conference presentations

bioCEED Personnel 2022

Name	Function in bioCEED, position	Unit
Sehoya Cotner	Centre director, professor	BIO, UiB
Stephen Coulson	Deputy Centre director, professor	AB, UNIS
Oddfrid Førland	Centre coordinator, PhD student	BIO, UiB
Jonathan Soulé	Senior engineer	BIO, UiB
Tina Dahl	Advisor, adm. and tech support	AB, UNIS
Christina Hess	Staff member, adm support	AB, UNIS
Kristin Holtermann	Project coordinator, administration	BIO, UiB
Roy Andersson	Associate professor II, academic developer	bioCEED
Lucas Jenø	Associate professor	PED,UiB
Gro van der Meeren	Core team member, senior scientist	IMR
Vigdis Vandvik	Core team member, professor, PI	BIO,UiB
Marius Ole Johansen	PhD candidate	bioCEED
Anja Møgelvang Jacobsen	PhD candidate	bioCEED
Christian Bianchi Strømme	Post doc	bioCEED
Simone Lang	Core team member, associate professor	AB, UNIS
Pernille Bronken Eidesen	PI, Associate professor II	AB, UNIS
Gaute Velle	PI, researcher, Prof II	Norce /BIO, UiB
Jorun Nyléhn	Core team member, associate professor	BIO, UiB
Ragnhild Gya	Project leader bioSPIRE	BIO,UiB
Kseniia Kalian	Post doc	AB, UNIS
Timon Brüggemann	Department engineer	AB, UNIS
Simen Hjelle	Field and technical assistant Thon Project	AB, UNIS
Student partners:		
Rebecca Gorniak	Student representative	AB, UNIS
Fredrik Selmer	Student representative	AB, UNIS
Marlena Wegner	Student representative	AB, UNIS
Line Framnes Voldmo	Student representative	AB, UNIS
Solvår Tørres Berntsen	student representative	AB, UNIS
Pernille Eyde Nerlie	Student representative /bioBEE	BIO,UiB and AB, UNIS
Jørund Johansen	Student research assistants (bioBEE)	BIO, UiB
Tonje Totland	Student research assistants (bioBEE)	BIO, UiB
Lars Martin Myhre	Student research assistants (bioBEE)	BIO, UiB
Ruben Schelbred Thormodsæter	Student research assistants (bioBEE)	BIO. UiB
Silje Maria Høydal	Student research assistants (bioBEE)	BIO. UiB
Susanne Zazzera	Student research assistants (bioBEE)	BIO. UiB
Emily Christensen	Student research assistants (bioBEE)	BIO. UiB
Sofie Haave Orthe	Student research assistants (bioBEE)	BIO. UiB

APPENDIX 2 Overview of dissemination and outreach activity

Many of these activities are further described in our [Newsletter](#) and cristin.no (project 468879).

The bioCEED community and beyond – seminars, workshops, courses

Table 5 bioCEED seminars and bioCEED Professional development activities 2022

BioCEED Professional development activities 2022		
Topic	Speaker(s)/Facilitator(s)	When and where
BioBERG, research group meeting	S. Cotner, M. O. Johansen, A. Møgelvang, J. Pooya, L. Jenø, K. Kalian, D. Grellscheid	Bi-weekly through the year, BIO/online
Leading Educational Change through SoTL	R. Andersson, S. Cotner, T. Roxå, A. Ahlberg	2021 –2022
Collegial Teaching and Learning in STEM (MNPED660)	Roy Andersson, Sehoya Cotner, and Oddfrid Førland	2022 –2023
Workshop on TeamBased Learning for course teachers and teaching assistants in BIO101	Sigrunn Eliassen	10. Jan. 2022, BIO
Workshop on virtual field guides in teaching	P. Bronken Eidesen and S. Hjelle	1.Feb. 2022, UNIS
Workshop on Team Based Learning for course teachers and teaching assistants in BIO101	Sigrunn Eliassen	21. Feb. 2022, BIO
From Practice to Publication, workshop	S. Cotner, J. Löfgreen, T. Gjesteland, S. Thompson	7-8. Mar. 2022, Oslo
Digital Teachers Meeting @ BIO: Teacher's lightning talks	Facilitated by Anne Bjune and Kristin Holtermann	10. Mar. 2022, BIO/online
Presentation of bioSTATS and R/Rstudio for the 100 club	Richard Telford, Marius Saltved, Facilitated by Kristin Holtermann	21. Mar. 2022, BIO
Teaching and learning course for PhDs, postdocs and master students	Ivar Nordmo, bioCEED, iEARTH	22-24 March 2022, UNIS
Workshop on Team Based Learning BIO101	Facilitated by A. Bjune and K. Holtermann	1. Apr. 2022, BIO
Workshop on Team Based Learning BIO101	Facilitated by A. Bjune and K. Holtermann	8. Jun. 2022, BIO
BIO Teachers Retreat I	S. Cotner, K. Holtermann, C. B. Strømme, S. Ellingsen	13. - 14. Jun. 2022, Park Hotell Voss
Mini Symposium bioCEED, invited researchers from USA	Facilitated by Sehoya Cotner- Speakers: A. Møgelvang, M. Johansen, C. Strømme, O. Førland, K. Holtermann, E. Christiansen, I. Pires Darcie (UPED), J. Pooya (iearth), S. Hammarlund, A. Olson (Uni of Minnesota), R. Costello (Auburn Uni)	8. Aug. 2022, BIO
Digital Teachers Meeting @ BIO – Student Workload	Lucas Jenø, Tina Dahl	8. Sep. 2022, BIO/online
Introduction of Grid-Arendal to some of the teaching and learning tools that are currently being developed through cross-departmental project FieldPass in connection to bioCEED	Steve Coulson, Pernille Bronken Eidesen, Simone Lang, Simen Salomonsen Hjelle, Kseniia Kalian	15 Sep. 2022, UNIS

Teaching portfolio workshop @ UNIS	Roy Andersson and Anders Ahlberg	19 Sep. 2022, UNIS/online
Teaching portfolio workshop @ MN/UiB	Roy Andersson	22 Sep. 2022, MN
Supervisor meeting for BIO299, presentation of course and grading rubrics	Vigdis Vandvik, Kristin Holtermann	11. Oct. 2022, BIO
Teaching portfolio support for ETP applicants	Roy Andersson, Henriette Linge	Oct-Nov. 2022
BIO Teachers Retreat II	S. Cotner, R. Gray, A. Bjune, R. Andersson, lightning talks from BIO teachers, K. Holtermann	28. - 29. Nov. 2022, Scandic Hotel Voss
TA course, Course for Teaching assistants/PhDs BIO ad Chemistry	Sehoya Cotner and Lucas Jenø	9-10 Jan. 2023

Table 6 bioCEED student meetings and seminars 2022

bioCEED Student meetings & seminars 2022		
Topic	Who	When and where
bioHIVE	Student partners at bioCEED	Bi-weekly through the year, BIO
biOrakel	Oracles	Every Wednesday, BIO
UNISoracle	PhD students and MSc students at AB	Run 14 times x 2 hours fall 2022, AB, UNIS
UNISbreakfast	PhD students and student representatives	2 Mar. 2022, UNIS
Meeting: How to prepare for an exam	L. Jenø and student representatives	14. Mar. 2022, UNIS
UNISbreakfast	PhD students and student representatives	20. Apr. 2022, UNIS
Student Poster Symposium at BIO, Spring 2022 (6 courses)	BIO teachers, BIO students Guest course: GEOF338 J. Soule, K. Holtermann (37 posters and <120 students)	19. May 2022, BIO
Meeting: Job opportunities	Sysselmasteren and student representatives	20. May 2022, UNIS
Conference: SCOPE- student led conference on Polar Environment	Facilitated and run by Anne Mol (75 participating students). bioCEED presentation by Amelia Kate Evavold at the conference.	6. - 7. Oct. 2022, UNIS
Workshop on qualitative data/ DEVELOP student research team meeting	DEVELOP student partners from UiB, UiO and UiT with DEVELOP research team	14.Oct. 2022, UiT, Tromsø
Workshop on qualitative data/ DEVELOP student research team meeting	DEVELOP student partners from UiB, UiO and UiT with DEVELOP research team	21.Oct. 2022, UiO, Oslo
Meetings: Movie and discussion about gender equity in STEM	bioCEED student representatives	24. Oct. 2022, UNIS
Student Poster Symposium at BIO, Fall 2022 (6 courses)	BIO teachers, BIO students Jonathan Soule, Kristin Holtermann (54 posters and <150 students)	22. Nov. 2022, BIO
Seminar: Exam preparation	bioCEED student representatives	6. Dec. 2022, UNIS

bioCEED reaching out - conferences, events, meetings and seminars

Table 7 Presentations at scientific conferences (peer reviewed) 2022

Presentations at scientific conference (peer reviewed) 2022				
Title	Occasion	Contribution	Authors	When and where
Student as partners through the eyes of students	Læringsfestivalen 2022	Talk	J. Johansen, LM Myhre, E. Christiansen	9. - 10. May 2022, Trondheim
Ensuring quality assessment practices under the two-evaluator law	Læringsfestivalen 2022	Keynote	S. Cotner, Y. Harlap	9. - 10. May 2022, Trondheim
Vurdering for læring - fra labrapport til sertifisering av mikroskopiferdigheter	Læringsfestivalen 2022	Talk	P. Bronken Eidesen, A. Bjune & S. Lang	9. - 10. May 2022, Trondheim
Digital cooperative learning in higher education	ICED2022 Sustainable Educational development	Poster	Anja Møgelvang & Ståle Ellingsen	31. May - 3. Jun. 2022, Århus, Denmark.
Considering other tactics while navigating wide change in HE.	ICED2022 Sustainable Educational development.	PAPER PRESENTATION.	Roxå, T. & Førland, O.	31. May - 3. Jun. 2022. Århus, Denmark.
Rewarded teachers as change agents.	ICED2022 Sustainable Educational development.	PAPER ACCEPTED.	Førland, O. & Roxå, T	31. May - 3. Jun. 2022, Århus, Denmark.
How to build social communities and learning environments through student-led programs	EuroSoTL2022	PAPER PRESENTATION	Marlena Wegner, Lars Martin Myhre, Emily Christiansen	15. - 17. Jun. 2022, Manchester, UK.
SCOPE – Student Led Conference on Polar Environments	EuroSoTL2022	POSTER PRESENTATION	Christina Hess	15. - 17. Jun. 2022, Manchester, UK.
How to facilitate significant informal conversations about teaching and learning	EuroSoTL2022	PAPER PRESENTATION	Eidesen, P.B., Førland, O., Håkansson, L.M., Christiansen, H.H., Dahl, T., & Strømseng, E.	15. - 17. Jun. 2022, Manchester, UK.
Scaffolding Educational Change through SoTL	EuroSoTL2022	PAPER PRESENTATION	Andersson, R., Cotner, S., Ahlberg, A., Roxå, T.	15. - 17. Jun. 2022, Manchester, UK
Are synchronous chats a silver lining of emergency remote instruction? Text-based chatting is disproportionately favored by women in a non-majors introductory biology course.	Society for the Advancement of Biology Education Research (SABER)	PAPER PRESENTATION	Cotner, S.	July 2022, Minneapolis, MN

Table 8 Presentations at seminars, workshops, conferences, etc 2022

Presentations at seminars, workshops, conferences, etc. 2022				
Title	Occasion	Contribution	Speaker	When and where
Kvifor meritterer vi framifrå undervisere? Kvifor vil framifrå undervisere bli merittert?	UiB Studiekvalitets-seminar	Invited talk	Oddfrid Førland,	26. Jan. 2022
Hvordan bruke studentevalueringer av undervisning	KUSK 5: Kompetanseutvikling for erfarne studie-konsulenter, modul 5 Kvalitet i utdanning	Invited talk	Kristin Holtermann	25. Feb. 2022, UiB Læringslab, UiB
Leveraging data in pursuit of gender equity in STEM higher education	GenderAct/UiB	Invited workshop	Sehoya Cotner	February 2022, UiB
In-class assessment workshop	MN Faculty Teachers Retreat	Invited talk	Sehoya Cotner	15.Mar. 2022, UiB Flesland
Peer assessment workshop	MN Faculty Teachers Retreat	Invited talk	Roy Andersson	15.Mar. 2022, UiB Flesland
Poster session for increased student learning	MN Faculty Teachers Retreat	Invited round table discussion	A. Bjune and K. Holtermann	15.Mar. 2022, UiB Flesland
Using videos as a substitute for lab journals	MN Faculty Teachers Retreat	Invited round table discussion	Jonathan Soulé	15. Mar. 2022, UiBFlesland
An Evidence-Based Approach to More Equitable Teaching	TELED seminar	Invited talk	Sehoya Cotner	23.Mar. 2022, UiB/Online
An evidenced-based approach to more equitable STEM Education	MN-fakultetets vårseminar	Invited workshop	Sehoya Cotner	7-8 April 2022, Solstrand, Os
Field learning: virtual field guides, certification and reflections	IEarth and bioCEED UNIS Field Learning Workshop	Workshop	Kseniia Kalian , Simone Lang and Simen Hjelle	19. Apr. 2022, UNIS
Virtuelle feltguider gir økt læringsutbytte I møte med virkeligheten.	HK-dir Konferanse: Utdanningskvalitet og digital omstilling 2022	Talk	Pernille Bronken Eidesen og Simen Hjelle	20. Apr. 2022, online
Presenting Educational Escape-rooms and boxes at OPPLEV marineholmen 2022	OPPLEV marineholmen 2022	Invited to host Escape-room and escape-boxes for visitors at OPPLEV	Ruben Schelbred Thormodsæter	23. Apr. 2022, UiB/OPPLEV
Students as partners @ bioCEED	MN Onsdagsmøte	Invited talk	Lars Martin Myhre	11 May 2022, UiB
SFU bioCEED and bioCEED courses	MN Onsdagsmøte	Invited talk	K. Holtermann and O. Førland	11 May 2022, UiB
Equitable assessment in STEM education	SFU MATRIC Annual Meeting	Invited talk	Sehoya Cotner	May 2022
Praksis i biologiutdanningen	Nasjonalt studieadministrativt MNT-seminar 2022	Invited talk	Kristin Holtermann	20.May 2022, NMBU, Ås/Larkollen
Paneldebatt om praksis i høyere MNT utdanning	Nasjonalt studieadministrativt MNT-seminar 2022	Panelsamtale	Kristin Holtermann	20.May 2022, NMBU Ås/Larkollen

"I don't know that I am a 'change agent' but if you say so, that sounds cool..."	MN Utdanningslederforum	Workshop	O. Førland, K. Holtermann, A. Bjune, S. Eliassen	16. June 2022, UiB
Digital cooperative learning: An intervention study in BIO103	Teachers retreat	Talk	Sehoya Cotner, Anja Møgelvang	June 2022, Voss
Low-effort, high-impact strategies for engaging all students in large lectures	UiB Faculty of Psychology Teachers' Retreat	Invited talk	Sehoya Cotner	Sep. 2022
The uses and outcomes of cooperative learning in undergraduate STEM education	Early career researchers symposium	Talk	Anja Møgelvang	8. Aug. 2022, UiB
Context matters: Determining when ecological-belonging interventions improve student outcomes	Early career researchers symposium	Talk	S. Hammarlund	8. Aug. 2022, UiB
The role of daily autonomy satisfaction and frustration in students' academic emotion states	Early career researchers symposium	Talk	M.O. Johansen	8. Aug. 2022, UiB
Field courses and Student Identity Salience	Early career researchers symposium	Talk	Alyssa N. Olson	8. Aug. 2022, UiB
The impact of diversifying and humanizing science role models on student attitudes and interest in science careers	Early career researchers symposium	Talk	Robin Costello	8. Aug. 2022, UiB
Characterizing undergraduate students' sense of belonging & test anxiety in Norway	Early career researchers symposium	Talk	E. M. Christiansen, S. Cotner, R. Costello, M. Glessmer, S. Hammarlund, & M. K. Kiani	8. Aug. 2022, UiB
The Students' role in a structured study program redesign process	Early career researchers symposium	Talk	O. Førland & K. Holtermann	8. Aug. 2022, UiB
How to create virtual field guides	Seminar UiO		Simen Hjelle and Pernille Bronken Eidesen	21. Sep. 2022, UiO
A presentation of cooperative learning – and how to facilitate it.	Teaching breakfast at GFI	Anja Møgelvang	Anja Møgelvang	22. Sep. 2022, GFI
Læring gjennom autentiske arbeidsoppgaver - eksempel fra yrkes- og forskningspraksis i biologi ved UiB	GeoPraksis Forum, Nasjonalt seminar	Invited talk	Kristin Holtermann	13. Oct. 2022, UiT, Tromsø
DEVELOP project - a presentation	Meeting with Sampraksis (project), Fiskerihøgskolen UiT	Talk	Sehoya Cotner	13. Oct. 2022, UiT Tromsø
A primer on EDU-Speak	Learning forum	Invited talk	Sehoya Cotner	25. Oct. 2022, UNIS, Longyearbyen
Education for sustainability: What does it mean and what it look like	Learning forum	Keynote with Yael Harlap and Atle Rotevatn	Pernille E. Nerlie	25. Oct. 2022, UNIS, Longyearbyen

How to assess practical skills in lab and field settings	Learning Forum	Workshop	Simone Lang, Pernille Bronken Eidesen and Anne Bjune	25. Oct. 2022, UNIS, Longyearbyen
An evidence-based approach to STEM education	Learning Forum UNIS	Workshop	S. Cotner, R.Andersson & O. Førland	25. Oct. 2022, UNIS, Longyearbyen
SCOPE – Student led conference on Polar Environment	Learning Forum UNIS	Poster presentation	Anne Mol	25. Oct. 2022, UNIS, Longyearbyen
Reflection tools	Learning Forum UNIS	Poster presentation	Kseniia Kalian	25. Oct. 2022, UNIS, Longyearbyen
Germinating popcorn and making spores dance- how to make undergraduates first meeting with plants a success	Learning Forum UNIS	Poster presentation	Anne Bjune	25. Oct. 2022, UNIS, Longyearbyen
Learning through assessment – exchange the lab report with certification of microscopy skills	Learning Forum UNIS	Poster presentation	Pernille Bronken Eidesen, Anne Bjune and S. Lang	25. Oct. 2022, UNIS, Longyearbyen
Bioracle and UNISoracle	Learning Forum UNIS	Poster presentation	Pernille E. Nerlie & Sine-Sara Astad	25. Oct. 2022, UNIS, Longyearbyen
ArtsApp – Digital Key for Svalbards vascular plants	Learning Forum UNIS	Poster presentation	Sil Schuurung and Simen Hjelle	25. Oct. 2022, UNIS, Longyearbyen
How the use of instructional videos can stop you from repeating the same thing over and over	Learning Forum UNIS	Sharing session	Lisa Baddeley	25. Oct. 2022, UNIS, Longyearbyen
Delingskultur og undervisningskvalitet	UiB Labfokost	Invited talk	Oddfrid Førland	27. Oct. 2022, UiB/online
Læringsutbyttebeskrivelser, erfaringer fra BIO/bioCEED	NOKUT workshop om praksiser rundt læringsutbyttebeskrivelser (LOBSTER)	Invited talk	Kristin Holtermann	7.Nov. 2022, HK-dir, Bergen
Hvorfor og hvordan skape et miljø for inkludering, åpenhet og kollegial deling rundt undervisningsutvikling	SIKT webinar	Invited talk	Oddfrid Førland	16.Nov 2022, Sikt/online
Virtual Field Guides as a pedagogical tool for field courses	MN Educational Committee	Invited presentation	Jonathan Soulé	23. Nov. 2022, UiB, Bergen
Student posters on display at Lyngheisenteret	Lyngheisenteret	Student posters	Bio Students	Fall 2022
The course-deficit model: improving the learning environment through instructional choices	NTNU (Trondheim) Strategy Day	Invited talk	Sehoya Cotner	Dec. 2022
For equitable STEM education, role models matter	Geophysics Institute (GFI) Teachers' Meeting	Invited talk	Sehoya Cotner	Dec. 2022
The course-deficit model: improving the learning environment through instructional choices	CELL SFU Teachers' Meeting	Invited talk	Sehoya Cotner	Dec. 2022

bioCEED publications 2022

- Jeno, L. M., Diseth, Å., & Grytnes, J-A. (2021). Testing the METUX model in higher education: Interface and task need-satisfaction predict engagement, learning, and well-being. *Frontiers in Psychology*; 10.3389/fpsyg.2021.631564
- Lucas M. Jeno, Kjetil Egelandssdal, John-Arvid Grytnes (2022). A qualitative investigation of psychological need-satisfying experiences of a mobile learning application: A Self-Determination Theory approach. *Computers and Education Open*, Volume 3, 2022, 100108. <https://doi.org/10.1016/j.caeo.2022.100108>.
- Møgelvang, A., Nyléhn, J. Co-operative Learning in Undergraduate Mathematics and Science Education: A Scoping Review. *Int J of Sci and Math Educ* (2022). <https://doi.org/10.1007/s10763-022-10331-0>
- Møgelvang, A., Vandvik, V., Ellingsen, S., Strømme, C. B., & Cotner, S. (2023). Cooperative learning goes online: Teaching and learning intervention in a digital environment impacts psychosocial outcomes in biology students. *International Journal of Educational Research*, 117, 102114. <https://doi.org/https://doi.org/10.1016/j.ijer.2022.102114>
- Møgelvang, A., & Nyléhn, J. (2023). Interdependence between Perceived Cooperative Learning, Sense of Belonging, and Generic Skills in Undergraduate STEM Education. *Nordic Journal of STEM Education*, 7(4) <https://doi.org/10.5324/njsteme.v7i1.4949>
- Harlap, Y., Jørgensen, C., & Cotner, S. (2022). Maintaining quality assessment practices in Norwegian higher education after the two-evaluator law. *Nordic Journal of STEM Education*, 6(1).
- Strømme, C. B., Lane, A. K., Halbritter, A. H., Law, E., Nater, C. R., Nilsen, E. B., ... & Cotner, S. H. (2022). Close to open—Factors that hinder and promote open science in ecology research and education. *Plos one*, 17(12), e0278339.

Additional publications S. Cotner (US based research).

- Robnett, R. D., Ballen, C. J., Fagbodun, S., Lane, K., McCoy, S. J., Robinson, L., ... & Cotner, S. (2022). Are synchronous chats a silver lining of emergency remote instruction? Text-based chatting is disproportionately favored by women in a non-majors introductory biology course. *Plos one*, 17(10), e0273301.
- Ewell, S. N., Cotner, S., Drake, A. G., Fagbodun, S., Google, A., Robinson, L., ... & Ballen, C. J. (2022). Eight Recommendations to Promote Effective Study Habits for Biology Students Enrolled in Online Courses. *Journal of Microbiology & Biology Education*, 23(1), e00260-21.
- Hammarlund, S. P., Scott, C., Binning, K. R., & Cotner, S. (2022). Context Matters: How an Ecological-Belonging Intervention Can Reduce Inequities in STEM. *BioScience*, 72(4), 387-396.
- *Olson, A. N., Cotner, S., Kirkpatrick, C., Thompson, S., & Hebert, S. (2022). Real-time text message surveys reveal student perceptions of personnel resources throughout a course-based research experience. *PloS one*, 17(2), e0264188.
- Creech, C., Just, J., Hammarlund, S., Rolle, C. E., Gonsar, N. Y., *Olson, A., ... & Cotner, S. (2022). Evaluating the Representation of Community Colleges in Biology Education Research Publications following a Call to Action. *CBE—Life Sciences Education*, 21(4), ar67.
- Ewell, S. N., Cotner, S., Drake, A. G., Fagbodun, S., Google, A., Robinson, L., ... & Ballen, C. J. (2022). Eight Recommendations to Promote Effective Study Habits for Biology Students Enrolled in Online Courses. *Journal of Microbiology & Biology Education*, 23(1), e00260-21.

Master theses

- Kjetil Rundereim Effekten av digitale identifiseringsverktøy på videregående elevers motivasjon og læring ved artsidentifisering: Et selvbestemmelsesteoretisk perspektiv. Veileder Lucas Jeno og John Arvid Grytnes
- Tonje Ailin Lokøy og Nathalie Sortland Studenters opplevelse av meningsskapende samsvar. En kvalitativ studie av studenters erfaringer med biologiemner ved Universitetet i Bergen. Veiledere Jorun Nyléhn og Christian Bianchi Strømme

Op -eds 2022

- Lars Martin Myhre og Ruben Thormodsæter: I Khrono: Bokstavkarakteren er utdatert, Khrono, 14.feb 2022 <https://khrono.no/bokstavkarakteren-er-utdatert/660954>
- Marius Ole Johansen (2022) *Slik overlever du eksamensperioden*, Studvest 16.nov 2022 <https://www.studvest.no/slik-overlever-du-eksamensperioden/>

Hearings

- Innspill til Høring om Læringsmiljø, UiB. Sendt på mail til UiB

Podcasts:

- Møgelvang, Anja (2022, 18/11). Samarbeidslæring i praksis. Lektor Lomsdalens innfall. <https://lektorlomsdalen.no/2022/11/ll-453-anja-mogelvang-om-samarbeidslaering-i-praksis/>

bioCEED online and in the media

See also our [web archive](#) for press.

- **Monthly bioCEED Newsletter:** <http://bioCEEDnews.w.uib.no/>
- **bioCEED Web pages:** <http://bioCEED.w.uib.no/>
- **bioCEED Web page UNIS:** <https://research.unis.no/bioCEED/>
- **Twitter:** @sfubioCEED @VVandvik @OysteinVarpe @lucas_jeno @Frueidesen @bioCEED_JS @oddfriidforland @sehoyacotner @laffustotalus @Ruben_ST
- **Facebook:** <https://www.facebook.com/bioCEED/>
- **Facebook UNIS:** <https://www.facebook.com/bioCEEDUNIS>
- **Instagram:** sfubioCEED
- Monthly updates from DEVLEOP project on DEVELOP webpages: <https://dvlp.w.uib.no/>

Contribution to quality development in higher education

- Kristin Holtermann contributes on module in UiB course for study admin; KUSK 5
- Contribution to the 5 year evaluation report on BSc Biology
- Christian B Strømme adapted and developed new student course evaluation form for BIO, implemented for all courses in BSc biology by the program board.
- Contributed to the use of student workload calculations at BIO and UNIS courses.
- First step towards offering a STEM course for teaching assistants, starting with biology and chemistry.
- Sehoya Cotner is chair of the external review committee for NTNU Institute for Biology, bachelors and masters programs
- Sehoya Cotner is Associate Editor with the Nordic Journal of STEM Education
- Sehoya Cotner is Associate Editor with CBE-Life Sciences Education
- Sehoya Cotner is Associate Editor with Ecology and Evolution
- Stephen Coulson leader of ECom – the Educational Committee at UNIS and Tina Dahl as bioCEED representative
- Stephen Coulson and Tina Dahl leading/members of new student learning spaces at UNIS working group
- Tina Dahl member of working group with PhD Duty work at UNIS

bioCEED platforms

- BiKUBEN: <https://bikuben.w.uib.no/nb/>
- bioST@TS : <https://biostats.w.uib.no/>
- bioPRACTICE student blogs: <https://biopraksis.w.uib.no>
- bioPITCH: <https://biopitch.w.uib.no/>
- BioWRITE: <https://biowrite.w.uib.no/>
- BioSKRIV: <https://bioskriv.w.uib.no/>
- Learning Arctic biology: <https://www.learningarcticbiology.info/>
- Virtual field guides, Svalbard: <https://360.learningarcticbiology.info/>
- Virtual field guides, Svalbard & Bergen: <https://bioCEED.w.uib.no/virtual-field-guides/>
- FieldPass: <https://research.unis.no/FieldPass/>
- Bjørndalen Integrated Gradient (BIG): <https://www.unis.no/project/big/>
- Internship students blogs from the AB-208 course: <https://blog.learningarcticbiology.info/>
- Teach2Learn: <https://teach2learn.w.uib.no/>
- ArtsAPP: <https://artsapp.uib.no/> and Identifiy arctic plants with your phone: <https://www.youtube.com/watch?v=i1lPoDaZrvo>
- Larvae Knowledge Incubator: <https://lki.w.uib.no/> , project leader Ivar Rønnestad.
- CodeRclub: <https://coderclub.w.uib.no/>
- Biorakel: <https://biorakel.w.uib.no/>
- Biospire: <https://biospire.w.uib.no/>
- UNISprout: <https://unisprout.w.uib.no/>
- UNISbreakfast: <https://unisbreakfast.w.uib.no/>
- DEVELOP: <https://dvlp.w.uib.no/>
- Information page for students: <https://bioCEED.w.uib.no/resources/explore-bioCEED/#norsk>

Awards

Awards 2022		
Who	Title	From
Vigdis Vandvik	Fremragende undervisning	Olav Thon Stiftelsen
Anne Bjune, Sigrunn Eliassen, Kristin Holtermann	UiB Arbeidsmiljøpris 2021	UiB HR-dagen 2022

APPENDIX 3 Accounting

See separate attachment.

APPENDIX 4 Externally funded projects

A full list of projects with and funding with bioCEED involvement can be found in the table at the end of this section. In the paragraphs below we give an overview of the projects tightly linked and integrated in bioCEED activities and core team.

Online learning platform for Arctic Biology

Granted by	Project period	Funding	PI/Main partner
Svalbard Environmental Fund	2018-2020	140 KNOK	P.B Eidesen (UNIS)

The funding period for the online learning platform Learning Arctic Biology at UNIS ended in 2020 with a final report summarizing the project. However, the platform has been further developed in 2021, and a former PhD student have been engaged as editor to prepare new material, and extra technical support from bioCEED has been allocated to aid publication. In cooperation with the FieldPass project, a set of Virtual Field Guides (VFGs) have also in 2021 and 2022 been added to the learning platform (<https://360.learningarcticbiology.info/>) and a “How to» guide regarding how to make the VFGs is submitted to the Nordic Journal of STEM Education. The Learning Arctic Biology platform has been introduced as part of the curriculum in different courses at UNIS. In 2022 the platform was redesigned to create a more user-friendly editorial framework, new material has been added on vascular plants, invertebrates and micro-organisms and the platform also includes the ArtsApp for Svalbard Flora.

FieldPass- “Development, testing and evaluation of tools and assessment forms that promote constructive alignment in field teaching”

Granted by	Project period	Funding	PI/Main partner
DIKU Aktiv læring	2019-2023	4800 KNOK	P.B. Eidesen (UNIS)

The project FieldPass at UNIS aim to develop and test alternative ways of assessment suitable for assessing/evaluating knowledge, practical skills or general competences achieved through field and lab work. In partnership with UiB and UiO, we will test arena innovative field and lab preparations and assessment of learning in the field and in the lab. We have identified three development areas we will focus on in this project 1) digital tools for preparation and assessment, 2) certification as assessment of practical skills, and 3) reflection combined with concept maps as assessment tool. The project was put on hold through 2020 due to Covid-19 and will end in early 2023. The cancelling of courses and restricted number of people that could attend field activities forced the project to find other ways of testing tools for e.g., certification where ways of doing certification in the lab have been tested rather than in the field. Digital tools (like virtual field guides and instructional videos) are developed, but the testing of these tools has been less extensive or different from initially planned. Reflective tools to be used for evaluating students’ reflections during fieldwork have been developed and tested. [A project homepage](#) is created to enhance the sharing of tools developed. See Box 1 and table 2-A11 for details.

ArtsApp: How technology impacts motivation and interest for learning species

Granted by	Project period	Funding	PI/Main partner
NFR, Finnud	2018-2022	5900 KNOK	J.A. Grytnes (BIO) and L.M. Jenø (IPED)

ArtsAPP develops an interactive app for species identification. The overarching goal is to optimize ArtsApp and enhance students' motivation and learning for species identification. ArtsAPP have published the results from an experimental study we conducted with colleagues from the University of Stavanger. This [study](#) was published in Computers & Education. Another study is published in Frontiers of Psychology, in which we investigate if user interface and different functionalities in different learning tools have an impact on students' engagement, wellness, and learning (Jenø, L. M., Diseth, Å., & Grytnes, J-A. (2021). Testing the METUX model in higher education: Interface and task need-satisfaction predict engagement, learning, and well-being. *Frontiers in Psychology*; 10.3389/fpsyg.2021.631564). We are working on implementing different functionalities based on a qualitative study we did with students. We conducted focus group interviews with bachelor and master students and received a lot of useful information about ArtsApp and how to improve the app both for motivational and learning purposes. This study is under published in Computers and Education Open (Lucas M. Jenø, Kjetil Egelanddal, John-Arvid Grytnes (2022). A qualitative investigation of psychological need-satisfying experiences of a mobile learning application: A Self-Determination Theory approach. *Computers and Education Open*, Volume 3, 2022, 100108. <https://doi.org/10.1016/j.caeo.2022.100108>.) Kjetil Rundereim successfully defended his Master of Science (Teacher education) thesis investigating the difference between ArtsApp and ArtsOracle on upper-secondary students. The MSc thesis was written as part of the ArtsApp project. More on ArtsApp [here](#).

Artsapp for Svalbards flora

Granted by	Project period	Funding	PI/Main partner
Svalbard Environmental Fund	2019-2022	200 KNOK	P.B. Eidesen (UNIS)

The first full version of Artsapp for Svalbard was launched in June 2020, covering all vascular plants in Svalbard except graminoids. The current version then was only available in English. A Norwegian translation was developed and launched in spring 2021. During spring and summer 2021 the key was tested out and introduced as a tool within terrestrial courses at UNIS. A PhD student together with course students at UNIS have developed the graminoid key through 2021 and 2022. This key was also translated into Norwegian in 2022. More illustration will be added during spring 2023 and the key will be tested further out prior to launching it before summer 2023. For project summary report read [here](#). Enjoy a small advertisement of the [flora in Svalbard](#), [the app](#), and [an intro to how to use it](#).

REdesign- Student active research and transferable skills in redesign of the biology education

Granted by	Project period	Funding	PI/Main partner
DIKU Aktiv læring	2019-2022	4500 KNOK	S. Eliassen /S. Cotner (bioCEED/BIO)

The project is a partnership with BIO and UiB Læringslab. Following a 8-step [model](#) for study programme redesign, the project is currently redesigning the BSc Biology UiB, while also adapting the model to Norwegian higher education context. A core team of BIO teachers, students, postdoc, coordinator, didactics expert and UiB learning lab runs the project. The core team has conducted workshops on developing intended learning outcomes and has also involved faculty through digital meetings. The project reports to the Programme board at BIO. Through a process of backwards planning, the intended learning outcomes form the basis for learning rubrics for the program. The project focus on developing generic skills in teaching and learning, as well as alignment throughout the program. bioWRITE, TA course, poster sessions and the 100club are examples of activities and innovations in this project (see Box 1). Students are highly involved in the project, both in the core team, and as student research technicians (bioBEES). See above text for 2022-activities and 2023-plans.

Cross disciplinary high arctic field Laboratory for research and teaching

Granted by	Project period	Funding	PI
Thon Stiftelsen	2019-2021	1350 KNOK	P.B. Eidesen (UNIS)

AB Department at UNIS got a funding to support development of a Field Laboratory in Bjørndalen. The Field Lab is part of the departmental project [BIG \(Bjørndalen Integrated Gradient\)](#) close to Longyearbyen for education and research. In BIG, AB is combining resources to study and link systems from the marine realm, through the coastal zone and onto land. In 2021, the Field Lab provided a research arena for students in the practical course AB-207 Research Project in Arctic Biology (15 ECTS) and research internship students working at the site during summer 2021 collecting data and setting up instrumentation. The Field Lab efficiently links field activities in different courses across seasons. In 2022 internship students from AB-207 collected data from the site and students in AB-201 used the site as an introduction and test area for gradient measurements.

Vugge til Grad – student active research

Granted by	Project period	Funding	PI
Thon Stiftelsen	2019-2022	1500 KNOK	V. Vandvik, O. Førland, R. Gya

This project explore how exposure to, and practical experience with participating in, science and the scientific process can support student learning and motivation. Through our development projects (bioSPIRE, course-based research practice at the BSc, MSc, and PhD level) we explore different approaches to student-active research, and assess the impact of these approaches on student learning outcomes and motivation. The projects complement each other in that they meet student at different levels, put different demands on the students, diverse forms of collaboration between students and between students and supervisors/mentors, and thus they also provide diverse learning outcomes. Many project outcomes are documented through the [Teaching and Learning Toolkit](#). At the end of the project in 2022 we report development of biORAKEL (training for oracles, [toolkit](#)), toolkits ([how to make your own research practice course](#), [creating a student-research community](#) etc.), development of [bioSPIRE](#). In [higher-level courses](#), planning, data management and publishing is increasingly included, and BSc courses [the student poster session](#) is a major outcome of this project.

RECITE - Research and Education Partnership in Climate Change Impacts on Terrestrial Ecosystems

Granted by	Project period	Funding	PI
NFR NTPART	2018-2022	5787 KNOK	V.Vandvik, with S.Cotner, A.Halbritter and others

RECITE develops and studies student-active research experiences through international student exchange for internships, and international research-based field courses. A focus of RECITE is to expose students to the full reality of research, including a reproducibility throughout planning, conducting, and managing data from research projects. RECITE supports the courses (and to some extent internships) with a string online scaffolding, which proved an added value supporting student learning, course and project sense of community, and inclusion and sharing of knowledge during the pandemic and associated shutdowns. This has inspired greater attention to the potential added value of open and reproducible science practices in our team, which again inspired the MORE proposal to allow us to develop and document these issues further. The international internship experiences were shifted to local internships and remote internships during the pandemic. The RECITE project (ended in 2022) has contributed new knowledge on trait-based plant and ecosystem ecology from five mountain ranges on five continents (including non-PFTC data from UoAs' site in Colorado), and improved methods and approaches, especially related to open and reproducible data management practices and research-education integration. We have designed, implemented, and tested approaches to student-active research experiences in courses and internships, and collected data that allows us to share these.

ExperTS: Experiments, Traits, Synthesis: Using knowledge from global ecological experiments to validate, assess, and improve trait-based theory

Granted by	Project period	Funding	PI
NFR IntPart	2019-2023	5906 KNOK	V.Vandvik, with S.Cotner, A.Halbritter et al

ExperTS is a follow-up project from RECITE, focusing more on integration of ecological theory and synthesis with field-based and reproducible research experiences.

NJSTEME workshop: From Practice to publication

Granted by	Project period	Funding	PI
UHR-MNT	2022-2023	250 KNOK	S. Cotner, T. Gjesteland (Matric)

The editors of the Nordic Journal of STEM Education will hosted a two-day in-person workshop (March 7 and 8, 2022, Oslo) to guide 21 participants in developing a manuscript for NJSTEME. The workshop consisted of two consecutive days of in-person activities and a follow-up meeting for each participant or team with one of the facilitators. [More on workshop.](#)

Leading Educational Change

Granted by	Project period	Funding	PI
UHR-MNT	2022-2023	160 KNOK	R. Andersson (bioCEED)

The new course, *Leading Educational Change – through SoTL* is a pilot initiative involving two Centres for Excellence in STEM Education (see above). This course is **innovative** along multiple dimensions. The course involves academic-change leaders from several institutions **across Norway**, representing a collaboration between bioCEED and iEarth, and is led by bioCEED and iEarth faculty from UiB and Lund University in Sweden. The course was concluded in 2022. 19 participants from 4 institutions completed the course (5 ECTS). The participants completed 7 group projects (*Driving educational culture transformation during large-scale change among geoscience university faculty in Norway; A qualitative study of local educational leadership, change agents and grass root leadership at MN Faculty UiB; Intern kommunikasjonsstrategi, iEarth; Making sense? Testing an early prototype of a curriculum app; When students inform local climate policy – An activity analysis of a course-based undergraduate research project at the University of Bergen; Core Themes in Critical Thinking: Perspectives from Students and Teachers; Implementing student-staff partnership informed by eight change theories*). Several projects will be presented at MNT2023. The course concept was presented at EuroSoTL2022 in Manchester.

Team-based learning

Granted by	Project period	Funding	PI
UHR-MNT	2022-2023	93,5 KNOK	A. Bjune (BIO)

A digital workshop was held in Dec 2021 with the theme *What is Team Based Learning (TBL) and how to do it (in your course)* for 10 participants that teach the BIO101 Organismal biology spring 2022. In 2022 a number of face-to-face workshops was held to discuss and organize student activities in an active learning room, using *BIO101 as case*. The workshops had teachers, TAs and study admin participants. This project has hired a student partner to develop TBL in BIO101 spring 2022, and different TBL activities were tested in BIO101 during the semester. Student feedback on the TBL activities have been collected to inform further development. From spring 2023 the course BIO101 will fully student active, and traditional lecture are replaced with seminars and discussions. The results of this project will be presented at MNT conference 2023 (*Omlegging fra tradisjonelle forelesninger til studentaktiv læring – _eksempel fra et grunnemne i biologi*).

Developing evidence-based mentoring for better STEM work placements (DEVELOP)

Granted by	Project period	Funding	PI
HKDir- ARbeidslivsrelevans	2022-2024	4 700 KNOK	S. Cotner (bioCEED)

DEVELOP is a three-year project, involving collaborators from the Institute of Marine Research, NORCE, the University of Bergen, the University of Oslo, the University of Tromsø, and two Centres for Excellence in Education—iEarth and bioCEED. The project is coordinated by bioCEED and led by centre director Sehoja Cotner. DEVELOP will focus on the work placement hosts, with the objective to increase the (learning) outcome for students, hosts and higher education institutions during work placements. DEVELOP seeks the continued input of many work-placement supervisors, in developing a series of on-line modules to assist in mentoring student workers. These modules will be based on a combination of theory, past program evaluation data, and in-depth assessment via student focus groups and host interviews. See [updates on project web page](#).

New proposals 2022

- Test Anxiety: Rethinking Assessment in Introductory STEM (TARA) – PI Sehoja Cotner, NFR
- Mobile INtegration or Distraction: Understanding the motivating, distracting, or educating roles of technologies in higher education (MIND), PI Lucas Jenø, NFR
- Open (Undergraduate) Research Systems (OURS), PI Christian Bianci Strømme, NFR

Table 9. Full list of externally funded projects with bioCEED involved (granted) 2014- 2022

Granted by	Project title	Project period	Funding	PI/Main partner
NFR	Travel Grant ArtsAPP, Robin Costelloe	2022	71 KNOK	J.A. Grytnes (BIO)
Olsens legat, UiB	Studentaktiv forskning på økologiske samspill i kystlynghei	2022	30 KNOK	C.B. Strømme (bioCEED)
Intpart	Confect -Connect and Infect - An interactive network to advance research and education in viral ecology and evolution	2021-2026	10 mill NOK	S. Våge (BIO)
UiB	Arbeidsmiljøprisen	2021		
UiB, MN	Formidlingsprisen	2021	50 KNOK	V. Vandvik
Thon Stiftelsen	Pris for fremragende undervisning	2022	500 KNOK	V. Vandvik
UHR-MNT	NJSTEME workshop: From Practice to publication	2022	250 KNOK	S. Cotner (BIO), T. Gjesteland (UiA)
UHR-MNT	Leading Educational Change	2021-2022	160 KNOK	R. Andersson
UHR-MNT	Team Based Learning workshops	2022	93,5 KNOK	A. Bjune
UHR-MNT	Utvikling av kursmodell for bedre samhandling innen biofag-utdannelse i Norge	2022	900 KNOK	Nasjonalt fagorgan for biologi, Elina Haltunen, Steve Coulson (bioCEED)
DIKU Arb.livsrelevans	DEVELOP Developing evidence-based mentoring for better STEM work placements	2022-2024	4 700 KNOK	PI S. Cotner
NFR/DIKU Intpart	Excel AQUA II - Norway-Japan Partnership for Excellent Education and Research in Aquaculture	2020-2024	3500 KNOK	PI I. Rønnestad

Thon Stiftelsen	<i>Pris for fremragende undervisning</i>	2021	500 KNOK	S. Eliassen
DIKU Dig	<i>MOVUL – Mobilbasert vurdering som læring</i>	2020- 2021	550 KNOK	L.M. Jenø
DIKU Aktiv læring	<i>Utvikling, testing og evaluering av verktøy og vurderingsformer som fremmer meningssskapende samsvar i feltundervisning (FIELDPASS)</i>	2019-2022 (utsatt til 2023)	4800 KNOK	P.B. Eidesen (UNIS+ BIO)
DIKU Aktiv læring	<i>Studentaktiv forskning og overførbare ferdigheter i redesign av biologiutdanningen (REDESIGN)</i>	2019-2022	4500 KNOK	S. Eliassen
Thon Stiftelsen	<i>Utvikling av et høy-arktisk, tverrfaglig feltlaboratorium for forskning og undervisning</i>	2019- 2021	1350 KNOK	P.B. Eidesen (UNIS)
Thon Stiftelsen	<i>STUDENTAKTIV FORSKNING – FRA VUGGE TIL GRAD</i>	2019-2022	1500 KNOK	V.Vandvik, O.Førland, R. Gya, E. Lygre (BIO)
Thon Stiftelsen	<i>Pris for fremragende undervisning</i>	2019	500 KNOK	I.Rønnestad (BIO)
Olaf Grolle Legat	<i>Biology students knowledge in species identification</i>	2018	10 KNOK	L.M. Jenø
Svalbard Environmental Fund	<i>Artsapp for Svalbards flora</i>	2019-2022	200 KNOK	P.B. Eidesen (UNIS)
UiB	<i>Learning Environment Prize to biORAKEL</i>	2018	50 KNOK	Core team of students(BIO)
NFR, Finnud	<i>ArtsApp: How technology impacts motivation and interest for learning species</i>	2018-2022	5985 KNOK	J.A. Grytnes (BIO)
NFR/DIKU Intpart	<i>RECITE- Research and Education Partnership in Climate Change Impacts on Terrestrial Ecosystems (274831)</i>	2018-2022	4500 KNOK	V. Vandvik (BIO)
Svalbard Environmental Fund	<i>Online learning platform for Arctic Biology</i>	2018- 2020	140 KNOK	P.B. Eidesen (UNIS)
NFR/DIKU Intpart	<i>ExpertS - Experiments, Traits, Synthesis: Using knowledge from global ecological experiments to validate, assess, and improve trait-based theory (287784)</i>	2019-2023	4500 KNOK	V. Vandvik (BIO)
NFR/DIKU Intpart	<i>PRIMA LEARNING - Connecting hands-on-PRactice and Innovative MARine ecological sampling methods and analysis tools for enhancing student LEARNING"</i>	2018-2023	4500 KNOK	A.G. Salvanes (BIO)
NFR/DIKU Intpart	<i>Excel AQUA - Norway-Japan Partnership for Excellent Education and Research in Aquaculture</i>	2017- 2019	4500 KNOK	I. Rønnestad (BIO)
NFR/DIKU Intpart	<i>FILAMO - Connecting Field work and LABORatory experiments to numerical MOdeling in a changing marine environment. Project number: 261636</i>	2017-2023	3960 KNOK	Ø.Fiksen (BIO)
Thon Stiftelsen	<i>Numerical Competence and Student-Active Research</i>	2017- 2019	1400 KNOK	S. Eliassen, Ø. Varpe, J. Soulé
SiU, IntPART	<i>IScope (integrating Science of Oceans, Physics and Education) Project number 249718</i>	2016- 2018	4345 KNOK	K.Pittman, (BIO)
Thon Stiftelsen	<i>Research project student-active research: Økosystem, klima og</i>	2016- 2018	1137 KNOK	AG. Salvanes, (BIO)

	<i>variasjon i eit «mini-havøkosystem»: ein vestnorsk fjord</i>			
SiU - High North Programme	<i>TraitTrain. Comparing climate change impacts on High North vs. Alpine ecosystems through research and training in trait-based approaches HNP-2015/10037</i>	2016-2018	1500 KNOK	V. Vandvik. (BIO/UNIS)
Norgesuniversitet	Artsapp: En applikasjon for enklere artsidentifikasjon	01.01.2015-30.12.2017	550 KNOK	J.A. Grytnes (bioCEED)
Olsens Legat	<i>Effekten av ArtsAPP på studenters læring og motivasjon</i>	2015-2016	47 KNOK	L. Jenø (bioCEED)
Thon Stiftelsen	Excellent Teaching Award	2015	500 KNOK	C. Jørgensen (BIO)
Thon Stiftelsen	Excellent Teaching Award	2015	500 KNOK	K. Pittman (BIO)
UiB	Learning environment Award	2015	50 KNOK	C. Jørgensen (BIO)
WUN Research Mobility	Research stay at University of Rochester, USA,	Sept-Oct 2015	36 KNOK	L. Jenø (bioCEED)
UHR	Contribution to for talk at MNT-conference 2015	18-19.03.2015	75 KNOK	Ø. Fiksen J.A. Grytnes (bioCEED)
NFR- FINNUT programme	PRIME - How Implementation of PRACTICE can IMPROVE relevance and quality in discipline and professional Educations (knowledge building project). NFR Project number: 238043	01.08.2014-01.08.2018 (ext 2020)	7000 KNOK	G. Velle (bioCEED/Uni)
SiU- UTFORSK	TRANSPLANT. Student research experience linked to an international research project.	2014-2016	1109 KNOK	V. Vandvik. (BIO)
Research Council of Norway-FINNUT programme	ArtsApp: En applikasjon for enklere artsidentifikasjon (pre-project). NFR Project number: 237821	01.05.2014-30.04.2015	287 KNOK	J.A. Grytnes. (bioCEED)
UiB, PEK-programme	<i>Sammen for bedre læring</i>	03.04.14-03.04.15	280 KNOK	A. Raaheim (UiB)
Research Council of Norway-FINNUT	Travel scholarship for developing projects – University of Otago	autumn 2014	160 KNOK	P.B. Eidesen (AB)