bioCEED – Centre of Excellence in Biology Education

ABSTRACT: The bioCEED Centre for Excellence in Biology Education, one of eight centres for excellence in education in Norway, is built on the vision that biology, and the biologist, emerges in the interplay between biological theory, the practical applications of biological knowledge, and the relevance of biological theory and practical knowledge for society. This has implications, not only for what we teach, but for how our students are trained. To prepare our students for their future roles in science and society we will integrate theory, skills training and societal relevance in biology educations, focus on student learning and what benefits their learning and develop the teacher culture by building a collegial and scholarly culture of teaching and learning. bioCEED has a range of educational research and development activities within four main areas; teacher culture, innovative teaching, practical training, and dissemination. Teacher culture and development of Scholarship of Teaching and Learning (SoTL) practice among our teachers is a priority for bioCEED. Through collegial activities, support and contributions to ongoing processes and new initiatives locally, institutionally and nationally we support a SoTL-culture and practice. bioCEED is an advocate for teaching reward systems with SoTL-based criteria, for developing effective and supportive educational leadership and other measures that support and strengthen culture for quality in higher education. Educating biologists with competence in the full domain of biology require development of both the individual courses and programmes, and cross-cutting initiatives that ensure alignment and skills training. bioCEED develops, runs, and supports projects on student active learning, alternative assessment, and skills training. We encourage teachers and students to initiate small and large bottom-up projects for change and development, focusing on student learning. Central to ensuring societal relevance and sector contact is the work practice courses (internships) offered to biology students, and various arenas for exchange and communication with end users and biologists in the work force.

INTRODUCTION

bioCEED – Centre of Excellence in Biology Education, is built on the vision that biology, and the biologist, emerges in the interplay between biological theory, the practical applications of biological knowledge, and the relevance of biological theory and practical knowledge for society (Fig. 1).

bioCEED was awarded status as a Centre for Excellence in Education in 2014, with up to ten years of funding, pending a successful mid-way evaluation in 2017. The bioCEED consortium consists of two biology departments – Department of Biology, UiB and Arctic Biology, UNIS, in cooperation the Department of Education (UiB) and Norway's largest research institute within the marine sciences, Institute of Marine Research.

Figure 1. The 'domain of biology' as defined by the interactions between the development of scientific content knowledge (theory, factual knowledge), the practices within biology itself, and society's applications of and needs for this knowledge and these skills. ©bioCEED

Biology education has always had a strong theoretical ore, and we generally have a strong focus on training our students in relevant practical skills. In contrast, university programmes in biology have often ignored the societal relevance in implications of biology. In bioCEED, we believe that the biological triangle (Fig. 1) should have implications; not only for what we teach, but for how our students are trained. We need educations that can prepare our students for difficult and demanding roles in tomorrow's science and society. Towards this end, we will:

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

bioCEED has a range of educational research and development projects within four main areas; teacher culture, innovative teaching, practical training, and dissemination.

1. STRATEGIC FOCUS AREAS

1.1 Teacher culture

At the core of bioCEED's work is the realization that education, and educational quality, is a collegial responsibility. As each individual student is fundamentally responsible for his or her own learning, and as each individual teacher is also fundamentally responsible for the content and quality of the courses they teach, the overall responsibility is shared. Furthermore, students and teachers are not the only 'players' in the educational 'game', technical and administrative staff, teaching assistants, educational developers, and the departmental and institutional leadership are all part of the educational partnership. Together we shape the educational content and quality, both in terms of the subject matter and pedagogy, of our courses and programs.

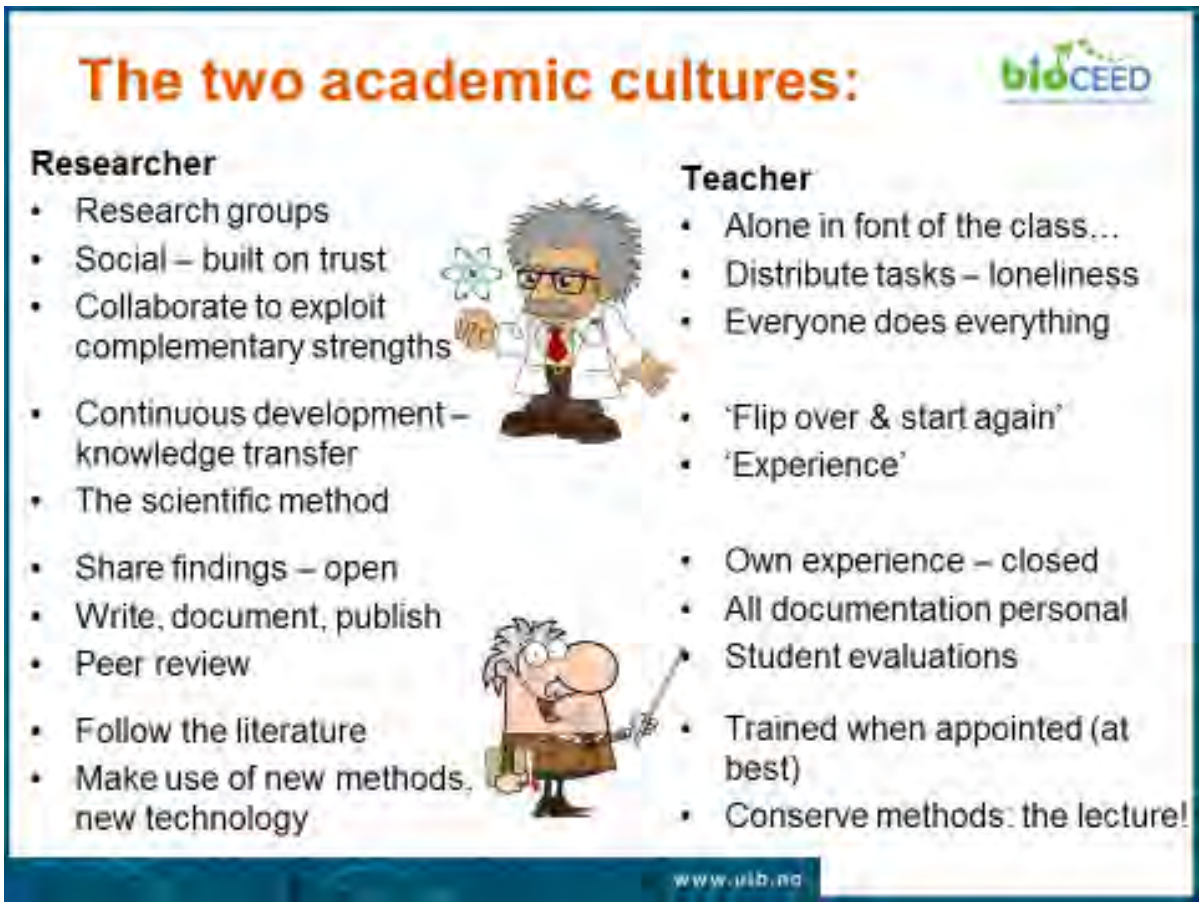

Figure 2. The 'two academic cultures' perspective on how and why to implement a Scholarship of Teaching and Learning perspective in research-centered university departments has become a bioCEED trademark. ©bioCEED

bioCEED's work to promote a teacher culture based on the principles of Scholarship of Teaching and Learning started by exploring why and how such a culture will benefit education, educational quality and the individual teachers (Fig.2). The next step was creating arenas where teaching staff collaboratively can develop their pedagogical knowledge and skills, and share and discuss teaching and learning. Such arenas now include teachers' retreats, collegial projects and courses, seminar series and workshops. While we started with a focus on the university teachers, these arenas and processes are now gradually expanding to include the broader teaching partnership, in that administrative and technical staff, and student representatives, also participate.

bioCEED also works to strengthen educational leadership and build organizational structures that support a scholarly teaching culture, and gives visibility and recognition to quality teaching. bioCEED is an important contributor to developing educational strategies and quality enhancing actions locally, at the institutional level, and nationally. A major milestone in 2016 was the establishment of the first merit system for teaching in Norway, Excellent Teaching Practitioner, established at the Faculty of Mathematics and Natural Sciences, UiB.

1.2 Innovative teaching

Developing and testing new teaching and learning methods and technologies is at the core of the bioCEED student-centered educational development. As illustrated by the bioCEED triangle (Fig. 1), the broad scope and range of biology in science and society, and the variety of subjects studied within a biology degree, offers great potential as a 'lab' for testing out a variety of teaching and learning methods. Exploring these opportunities is the core of the strategic development area Innovative teaching. Our educations and our educational development is research-based, meaning that we integrate biological research in our educational activities, and that our educational development is both based on, and contributes to, educational research.

Student motivation and educational outcomes are highly connected with using appropriate, student-active learning methods, and with having access to an appropriate learning environment. We are developing and testing a series of methods, tools, and skills to support learning. These range from specific new tools and learning methods within single courses, to more cross-cutting, programme-wide initiatives. bioCEED aims to expand and develop the learning environment by effectively combining traditional approaches with novel field, lab, and digital approaches to support learning in biology education.

An overarching bioCEED aim is to better integrate skills training in courses, and to better align this training throughout the educational programmes. We work towards this aim through several projects:

- *bioSKILLS* aims to develop transferrable skills across the biology curriculum by streamlining and linking teaching and learnings of skills. The first module to be populated is bioST@TS, which is designed to help students get a better grip on data handling and statistics in the context of biological studies.
- Teach to Learn *(TE2LE*) aims to stimulate student's creativity and develop their collaborative, communicative and pedagogical skills. Students creates video tutorials to teach their peers key scientific concepts.
- A joint project with SFU Matric is exploring opportunities for linking and aligning the mathematical and statistical content across courses to supporting learning and understanding in both subjects.
- Together for better learning (a co-operation between bioCEED, 3 UiB Faculties and SFU CEMPE) - aims to establish a better understanding of how and what students learn in, and from, practice.

bioCEED encourage and support teachers in testing and implementing new teaching methods, such as team based learning, flipped classroom, the use of digital tools and video production. Implementing new pedagogies are not an end to itself, however, and we encourage our teachers to see the broader picture in developing their teaching, and to strive to achieve alignment between learning outcomes, curriculum, learning and assessment activities.
Some of our current projects include:

- *ArtsApp*, a digital tool for species identification, developed as a collaborative effort between students, teachers and partners within and outside the university.
- Mapping of teaching methods using COPUS (Classroom Observation Protocol for Undergraduate STEM), and how teachers perceive their own teaching (Teaching Practices Inventory [TPI]). The study is accompanied by a student survey on motivation, engagement and confidence.
- Mapping teaching methods and student participation in biology and comparative politics courses at UiB, to investigate student participation, confidence, and gender aspects, in relation to teaching method and instructor behavior.

Student representation and participation is essential to all bioCEED's work, and students are involved at all levels in our projects and activities. In addition, we have a range of activities to ensure student engagement:

- Open student meetings and student seminars - aims to get the students' opinions on the different aspects of bioCEED's work, by discussing subjects such as what is good teaching, and different teaching and learning methods. The meetings and seminars are also used as forums for students to gain knowledge on specific subjects such as writing and reading skills or career options as a biologist.
- Student driven/student led projects - bioCEED support students in developing and running projects to improve educational quality and learning environment.

1.3 Practical training

One of the main hypotheses in bioCEED is that internships or placements in research, industry, and the public sector has potential to strengthen student motivation and support learning, also in disciplinary subjects like biology. A central goal is therefore to observe and assess to what extent

development of practical skills and workplace integration contribute crucial components to the student's experience of becoming a biologist.

bioCEED started offering internship-courses for biology students in 2015. These courses supplemented already-existing research project courses. Work practice is offered by a range of hosts and give students real work experience as biologists. bioCEED researches learning in internship and practice, and based on feedback from the students and preliminary analyses of results, we are confident that the learning outcome is high, and that other study programs may benefit from including internships. A novel aspect of the work practice courses is that student learning and development through the course are logged though blogs (http://biopraksis.b.uib.no), and that these blogs are used as course deliverables and in the student assessment.

The offer of "skills-courses" will be further expanded and practical skills training has also been integrated in several other courses through a range of activities. Sector contact is expanded across the curriculum, e.g. in the form of seminars with end user participation and invited talks in biology courses.
Another lower-key meeting place between students and workplaces is the annual career day. This is a student-driven activity that exposes the students to a broader range of career opportunities, and allows workplaces to promote themselves vs. potential employees.

1.4 Learn more about bioCEED

- Check out our web page: http://bioceed.b.uib.no/
- Sign up for the monthly Newsletter: http://bioceednews.b.uib.no/
- Follow us on Facebook, Twitter and Snapchat: https://www.facebook.com/bioceed/, https://twitter.com/sfubioceed, bioCEED Snapchat
- Check out the student blogs from work practice: https://biopraksis.b.uib.no/
- bioSTATS (first module of bioSKILLS): http://biostats.b.uib.no/
- Read the SFU Magazine: http://www.nokut.no/en/Centres-for-Excellence-in-Higher-Education/The-SFU-Magazine1/