

# Evaluation of the Master programme in Biosciences, University of Oslo

## Eksternal panel

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# Introduction and working methods

The external panel was appointed in December 2022 to assess the Department of Biosciences, UiO's self-evaluation report of the Master's program in biosciences.

In February 2023, the panel was given access to Periodic program evaluation and in mid-March, a meeting was arranged between department management and the external panel to clarify the mandate and any ambiguities in the internal report. We also met with two students in the program in May 2023. These student voices are represented below in quotes, to supplement our assessment.

The panel distributed the topics between them and created a first draft for each of the requested focus areas. We then had four digital meetings for discussion and compilation of assessments. In addition to the documents sent, the panel compared the self-evaluation against the description of the study on UiO's websites.

# The assessments

## Are the program's intended learning outcomes appropriate and relevant?

<p>Learning outcomes as described on the web site  <a href="https://www.uio.no/english/studies/programmes/bioscience-master/learning-outcomes/">https://www.uio.no/english/studies/programmes/bioscience-master/learning-outcomes/</a></p>	
<p>You will learn research methods during the master studies in Bioscience that are highly relevant to biological, molecular, biochemical, physiological, and medical oriented research. Modern pharmaceutical, biomedical, and biotechnological industries often base their research on such biochemical and molecular methods, but it is also becoming more computationally intensive and skills in statistics are increasingly sought. The need for knowledge of biological systematics and organismal groups is increasing, since Nature Management in Norway and abroad is becoming increasingly knowledge-based.</p> <p>The degree will qualify you for independent work, critical understanding of scientific publications and presentation of scientific data verbally and in writing. You will learn how research develops new knowledge during work with a 60 credit master's thesis project in a research group and by completing a set of compulsory and self-chosen subjects of 60 credits in total.</p>	<p><b>Knowledge aims</b>            You will be able to understand biological processes that take place in and between cells and in and between organisms in nature. This understanding will make you capable of describing and explaining both biological processes and their importance for living organisms.</p> <p>You will acquire knowledge of the most important research methods that are in use today to develop our knowledge in biological disciplines.</p>
<p><b>Competence aims</b>            You will be able to formulate <b>research</b> hypotheses, choose and adapt relevant methods, and perform systematic studies leading to their acceptance or rejection. You will be able to <b>work independently</b> in collecting and analyzing biological data, for example during field work or in the laboratory. You will be able to read <b>scientific publications</b> and develop a critical view of literature describing scientific topics. You will be able to give oral and written <b>representations</b> of scientific topics and research data.</p>	<p><b>Generic skills</b>            You will be able to <b>reflect</b> critically upon central ethical and scientific questions in relation to your own work and the work of others. You will develop your <b>scientific curiosity</b> and achieve understanding and respect for scientific values as openness, precision, accountability and the importance of distinguishing between knowledge and opinions. You will be able to identify and use <b>methods</b> well suited to solve a scientific question related to your own work, and to the work of others. You will be able to <b>communicate adequately scientific issues</b> both to colleagues and to the general public.</p>

## Appropriateness and relevance for further studies (domestic or international)

The program seems well suited for further studies in the fields covered.

## Appropriateness and relevance for employment

The career opportunities mentioned on the [program website](#) include a wide range of potential employers in research and management, both within the public and the private sectors. However, the learning outcomes seem more relevant for a career in scientific research than for any other opportunity mentioned. This disconnect between overarching aims (which include non-academic employment) and course learning outcomes is typical in study programs across Norway (and was mentioned in the last report of the UiO bachelor's program in biology), but highlights an emerging priority in Norwegian higher education. Specifically, students lack practical guidance regarding what is required for various types of jobs.

Further, the students in our focus group reported that employers expect students to have more practical skills, but it is not always clear (a) what is expected in the workforce, and (b) how to obtain these skills. Extra courses not included in the official program can help students to obtain these skills, but it's not always practically possible to take extra courses, and is it not always clear to the students how what they learn in these courses could be valuable in the job market.

When taking extra courses, students experience that it is the *guest* professors that seem most knowledgeable and involved in laws, regulations and other practicalities necessary for employment outside academia.

To evaluate if the programs are relevant for employment, it's useful to know where graduates typically find employment. Such statistics are not generally available. In addition to helping evaluate the program's success, this information could be useful to students throughout their time at UiO, and could therefore be highlighted on the program's web pages.

We do have statistics for Tekna members who graduated within the last 5 years, where of 1024 candidates, 125 are from UiO. These data show that health and social services are the most frequent employment areas, followed by teaching.

Nærings/hovedområde	biologi	biologi: bio- teknologi	biologi: botanikk	biologi: fysiologi og medisin	biologi: marin- biologi	biologi: miljø og økologi	biologi: molekylær- biologi	Grand Total
Helse- og sosialtjenester	2	3		4	1		29	39
Undervisning	7	3	2	2	1	2	8	25
Faglig, vitenskapelig og teknisk tjenesteyting	5	1		1	2	1	7	17
Annet/Uoppgitt	5	1		3	3	1	3	16
Offentlig administrasjon og forsvar, og trygdeordninger underlagt offentlig forvaltning	5	1		1	4	1	2	14
Industri	2	1					2	5
Varehandel, reparasjon av motorvogner							4	4

Bygg- og anleggsvirksomhet	1				1			2
Informasjon og kommunikasjon	1			1				2
Jordbruk, skogbruk og fiske	1							1
Grand Total	29	10	2	12	12	5	55	125

## Is the program suited to achieve the desired learning outcomes?

### Professional environment

Research Sections are presented at the website, allowing students to familiarize themselves with the staff and their research areas.

- [Aquatic Biology and Toxicology \(AQUA\)](#)
- [Biochemistry and Molecular Biology \(BMB\)](#)
- [Centre for Ecological and Evolutionary Synthesis \(CEES\)](#)
- [Genetics and Evolutionary Biology \(EVOGENE\)](#)
- [Section for Physiology and Cell Biology \(FYSCCELL\)](#)

### Courses offered

The Master's programme in Bioscience is a two-year full-time study consisting of 60 ECTS credits of mandatory and elective courses, and 60 ECTS credits for the Master's thesis, totaling 120 ECTS credits.

The elective courses can be chosen from a list of 48 courses, covering a broad spectrum of subjects within biology, ecology, and evolution as well as related methods, analysis and writing.

Most, but not all, programs have mandatory program-specific courses in the first semester. These often cover methods required for the research areas.

There may be options for choosing subjects that can prepare the student for a non-scientific (especially a non-research) career, but they are not marketed very clearly. This contrasts with the career opportunities mentioned on the program website, which lists a broad spectrum of options.

We note that there is only one neurobiology course offered for Master's students in biology, but this may not be an identified limitation. However, there is a physiology and neuroscience study program. Further, there are no limnology Master-level courses (freshwater algae is covered in one of the courses, and there is one aquatic biology course at the BSc level), and there is a marine biology and limnology study program. Again, this may not be a shortcoming...are students failing to obtain relevant employment or PhD positions in neurobiology or limnology? Alternatively, is the department sacrificing depth for breadth?

Focus group students mentioned that the broad introductory courses are great for an initial overview of the disciplines, but there are fewer possibilities for more focused paths.

Some programs are offered even if there are not appropriate courses offered. In these cases, students have to make their own *special curriculum*. This is regarded as positive in the sense that you learn a lot, but specialized courses would also have been welcome.

*“Only wish they had more programming in each course. You always have to work with programming. Wish programming was more integrated in courses.”*

*“Really miss a course in ethics. Wish there were more open discussions on what we can do or not do.”*

We are a little concerned that most courses use a single high-stakes summative exam to determine most, if not all, of a student’s grade. This is not evidence-based assessment, or the best strategy if you are interested in “assessment AS/FOR learning.” Further, there is evidence that this type of assessment can disproportionately impact women.

### **Generic skills**

The IBV-UB collaboration is impressive, especially if many students take advantage of this opportunity. There also appear to be several courses that have extensive laboratory methods and statistics skills training, but the degree to which students are exposed to these opportunities will vary by program.

*“Course on how to write scientific paper does exist” - but seems difficult to fit into the schedule.*

*“Maybe collaboration with PPU on communication (within and outside academia) would be great.”*

### **Course composition– multidisciplinary and interdisciplinary**

Even with an MS in BIO, some targeted careers will require additional training. The need for additional studies is only mentioned for teaching.

## **Does the program meet the stated goals?**

### **Does the program emphasize relevance for domestical and international employment and studies?**

Students have opportunities to participate in summer research, work-practice, and exchange programs, however it appears that few do, and it is not clear if this is holding them back in any tangible way (that is, it may not be affecting their prospects). The numbers for international exchange (27 over a four-year period, with 20 of those attending courses at UNIS) are especially low. (\*Note that recently UNIS courses have become more Norwegian, with some cohorts lacking non-Norwegian participants entirely. If this trend continues, attending UNIS can still be considered a great learning experience, but not an international one.) If international exchange is important to the department and future employers, efforts to encourage more students to participate in exchange programs are warranted. It does appear that currently, these offerings (work-practice, summer research, and international exchange) are mostly left to the students to identify and pursue. Again, this is not necessarily problematic, unless the department decides increased participation is a priority.

*“Companies are coming and presenting themselves. If you are really interested, and have the motivation, it's no problem finding the information.” “The University provides information on what is going on, conferences etc. We have access, can apply.”*

*“It’s possible to get summer projects in the research group. Many MSc students get the MSc project that way.” “You have to get this information through other students.”*

### **Does the program facilitate a good learning environment?**

According to the students we spoke with, student counselors are always available and open, which can help a lot in handling general problems.

Students seem to easily get involved in research groups, especially if they are proactive. *“We have a group meeting every Friday. Also have meetings with other research groups. Meetings are not mandatory, but MSc students are invited.”*

However, students would appreciate more structured information regarding practicalities of the Master’s program. *“In the beginning of the program it would have been helpful with someone to tell you more about how to do the project. You spend more time than necessary due to lack of structured guidance. [As a student you] don’t know how much work is needed for the thesis. Many small things led to longer time than expected for the thesis. It could have helped with some examples and ideas of how to structure the thesis work.”*

One major challenge is access to, and availability of, supervisors. Sometimes students get several supervisors, with different levels of supervisory experience. However, there do not seem to be routines for cooperations, and it’s not always clear what to expect from each of the supervisors, nor what the supervisors expect from the students. This concern echoes similar recent conversations at UiB, and point to a need to have program-level discussions around mentoring routines and practices.

*“If you have a new PhD student as a co-supervisor you get more help. If you only get post-docs or professors, they don’t always know what you are capable of or not.”*

Another challenge is that if supervisors get sick, leave, or for other reasons don’t follow up, there don’t seem to be established routines for following up with the students. One student says *“I felt very alone, and tried to tell that I needed a new supervisor. I was told to ask around. There is no continuity at all. I am not sure how to resolve the problem.”*

*“Before the pandemic, each Friday students could present what they were working on. This was very inspirational, helpful for getting ideas for what could be done, and an opportunity to talk to students and get answers to practical questions. Would be great to have such arrangement in each department. Also lack more cross faculty arrangements. Much collapsed during the pandemic, and did not reappear.”*

### **Does the program have good execution?**

Students report *“Courses no problem, but the project could use some more structure.”*

However, they did note that some areas have many courses to choose from, and some areas (e.g., limnology for the aquatic biology program) lack courses entirely.

*“The programs are good if you just want to take a degree. You can take a lot of courses, make contacts and finish a program. However, if you have really specific goals, they are not able to help. Assumed there were courses in the programs they have master programs for.”*

# Recommendations

## Continuation and focus for further improvements.

Currently the program seems very well suited for students aiming for a research career in the private or public sector. We focus on a few areas for departmental consideration: 1. Work relevance; 2. Program offerings; 3. Supervisor expectations; and 4. Assessment.

**First**, if the intention is to prepare students for a broader employment market, **the incorporation of work relevance into the programs should be re-evaluated**. If there is general agreement that work relevance can be further emphasized, then we can offer several suggestions for consideration.

Given that many / a large proportion of the students will find their career in the public sector, administration, teaching or Health and social services, adding course options in the direction of administrative or legal/regulatory subjects could be considered. Or, at minimum, directing students to suitable options beyond the department could be valuable.

Students also call for better availability of practical courses, including courses focusing on, or at least including programming, ethics, and scientific writing. Further, where these transferable (or “generic”) skills are integrated into courses, it could benefit the students to have their value, in a possible future job market, articulated. This need to highlight the transferable skills that students are obtaining is pervasive in STEM higher education, so UiO is certainly not alone!

To raise awareness of the relevance for employment, it could be considered to structure the programs according to “intended use”, for example *scientific*, *administrative*, and *technical*. It would probably be very challenging for a university, being very focused on the sciences, to adjust courses accordingly. However, giving the students more freedom to choose and structure the information presented along such lines, could help students adjust their education to better fit the needs of the employment market. At a minimum, the value of specific courses to potential employers in the scientific, administrative, and technical arenas could be conveyed to the students.

The course descriptions could point out which course-related skills are relevant for working life and help students to articulate which desired competencies they are developing. Furthermore, an emphasis on aligning learning outcomes with course activities and assessments would help students to make these connections beyond the classroom.

A formal structure to support work-practice (“internships”) would address some of the work-life issues. A course that supports work practice is a simple (in theory) solution, but it would take work to establish. UiB has such a course, and this model has been modified for use at UiO (but not at the Master’s level) and UiT. If such a program is prohibitive, we encourage the department to consider avenues for building bridges between local and national employers in relevant sectors and your MSc students. Established mechanisms include incorporating work-practice opportunities into the curriculum, involving industry representatives on masters’ theses committees, and inviting these individuals to participate on career panels, as guest lecturers in obligatory courses, CV-development workshops, etc. A simple strategy



would be to incorporate specific examples, from outside academia, of the applications of the biology material they are learning.

If taking extra courses not included in the program is in fact necessary to get the generic skills required for employment, this should be better communicated to the students.

**Our second main recommendation** is to have a program-wide discussion of the *depth versus breadth* challenge. There do seem to be many areas where students *can* pursue research, but these areas may not all be supported by relevant coursework. If this assessment (based on the course offerings and student input) is correct, then it could be valuable to consider whether it is better to focus on fewer areas, but more thoroughly and with more freedom of choice.

This recommendation is in line with what you already note in your self-evaluation: *Although there is an aim to include most directions in modern bioscience in the curriculum of IBV courses, there is by necessity a need to select prioritised areas. Strategic decisions on which research directions to favour at each crossroad are critical for the future of the Department and for the directions of study that will be offered to students in the future.*

**Our third main recommendation** is to consider how supervisors are prepared for their roles, and whether there is a need to establish more specific routines and expectations, and whether additional mentor training is warranted. However, we note that our input here is based on feedback from one student. Yet, generally speaking, to help students through the programs more efficiently, improved routines for introduction to the program, research expectations, and follow-up procedures could be discussed. This is also a current challenge for many of your peer departments across Norway (and beyond).

**Our fourth main recommendation** involves assessment. It would be good to look at course data to ensure that there are no gender-biased performance differences that are predicted by assessment type, especially in the more competitive courses. And regardless of disparities, an effort to boost assessment *for learning* can benefit all students.

For MSc students, this could include more formative assessments, portfolio assessment, or competency-based grading. The strength of, e.g., portfolio assessment is that it can be structured to allow students to engage in metacognition about their learning and the skills they are acquiring, and could address some of their concerns about how to “sell” themselves to future employers. See Harlap et al (2022) for additional suggestions.

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