



MSc Biological Sciences
University of Amsterdam

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Project code P2116

Inhoud

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Summary

Standard 1. Intended learning outcomes

The panel appreciates the programme's clear profile. The four tracks are very well-defined and clearly reflect the research orientations of IBED and SILS. The panel is also pleased with the broad spectrum of possibilities the profile offers. In addition to research-oriented specialization, students are able to broaden their knowledge and skills through more societally-oriented components. The ILOs are in line with the programme's profile and consist of both generic ILOs and track- and major-specific ones, as well as some additional ILOs for the Tesla minor. The ILOs are well-formulated and sufficiently concrete and reflect the Dublin descriptors for the master's level. They tie in well with the Domain-Specific Framework of Reference and correspond to the demands of the *Sectorbeeld Biologie* policy paper. The panel suggests integrating ethics, integrity, and adherence to the scientific code of conduct more firmly into the ILOs. The panel is very pleased with the two Advisory Boards as they can help the programme to stay up-to-date and attuned to the wishes and needs of both the academic and the non-academic professional fields.

Standard 2. Teaching-learning environment

The panel highly appreciates the curriculum of the MSc Biological Sciences programme. The curriculum's basic design is clear and well-structured and offers students considerable freedom in designing their own study trajectory. The curriculum adequately covers the ILOs (for all tracks under review), is feasible and up-to-date, and features a good integration of New Biology, statistics, and bioinformatics. The panel is also pleased with the attention paid to academic, professional, and soft skills training throughout the curriculum. The curriculum is clearly based on the research foci of IBED and SILS, and research and education are tightly-knit. The panel appreciates the strong emphasis on fundamental research. The literature review and the two substantial research projects, which can be prolonged, provide ample opportunity for students to conduct in-depth and varied research in the field. This offers students excellent opportunities to prepare for a PhD trajectory. Another particularly strong aspect of the programme is the opportunities it offers students to integrate societally-oriented components, such as a major, the Tesla minor, and the student labs. The panel specifically applauds these last two initiatives since they offer students a very good impression of working in non-academic professional work contexts. In the panel's view, the combination of these two well-organized study paths, a highly research-oriented one and a societally-oriented one grounded in a sound fundamental basis, is a true asset of the programme. The panel is, furthermore, pleased with the small-scale, varied teaching methods and the master-apprentice approach used for the research projects. The teaching staff have the proper qualifications needed to deliver the programme. Students of all four tracks under review are adequately supported and guided. The information provided on the majors and about going abroad could, however, be improved. Students highly appreciate the kind and supportive atmosphere in the programme and praise their lecturers for their approachability, enthusiasm, and dedication. The panel commends the staff for their efforts during the pandemic. The (lab) facilities are adequate.

Standard 3. Student assessment

The panel concludes that assessment in the MSc Biological Sciences programme is in accordance with UvA's assessment policy and the programme's assessment plan. The assessment for all four tracks under review adequately covers the learning objectives and the ILOs. On the whole, the quality of assessment in the programme meets the standards. The assessment methods are varied and adequate, and elaborate feedback is often provided, which the panel appreciates given the importance of feedback for students' learning. The Tesla projects studied by the panel clearly demonstrate the achievement of the additional Tesla minor ILOs. The panel believes that assessment in the Tesla minor should also take the individual contributions of students into account. The panel supports the Examination Board in its efforts to change the

situation and strongly encourages the Tesla minor to develop an assessment method for projects that recognises individual student contributions.

The panel considers the assessment procedures of the literature review and the research projects well-designed and commends the programme on the high quality of the associated grading forms and the rubrics. For the research projects, the panel recommends that the examiner assess the oral presentation as well. Furthermore, the panel recommends the programme to see to it that sufficient written feedback and substantiation of the assessment (also in cases with grades lower than 8) *always* be provided.

The panel concludes that adequate guidelines are in place to ensure the quality of assessment. Furthermore, the EC-ALW has formulated solid procedures for the evaluation of assessments. The EC-ALW (together with the Biological Sciences Subcommittee) safeguards the quality of assessment and the exit level of students in an excellent way. The panel hopes that a new test expert will be employed soon so that they can support the EC-ALW, the Biological Sciences Subcommittee, and the teaching staff.

Finally, the panel concludes that the cooperation with VU Amsterdam is based on mutual transparency and trust. The panel acknowledges the merits of the hands-on approach, which works well for both parties. This is also the case for the majors, where trust is based on the accreditation of the programmes involved, although the EC-ALW could invest in a more structured relationship with the associated Examination Boards.

Standard 4. Achieved learning outcomes

The panel concludes that the final projects of the MSc Biological Sciences demonstrate the realization of the programme's ILOs. They are clearly of the level and quality that can be expected from MSc final projects in the field of Biological Sciences. The projects clearly reflect the various research interests of the four tracks and are often of very high quality. The alumni look back on the programme with great satisfaction and feel that the programme prepared them well for their careers. They find employment in relevant jobs in the Netherlands and abroad, both inside and outside academia.

Score table

The panel assesses the programme as follows:

MSc Biological Sciences

Standard 1: Intended learning outcomes	meets the standard
Standard 2: Teaching-learning environment	meets the standard
Standard 3: Student assessment	meets the standard
Standard 4: Achieved learning outcomes	meets the standard

General conclusion positive

Ton Bisseling, chair

Mariëlle Klerks, secretary

Date: 11 April 2022

Introduction

Procedure

Assessment

On 8 and 9 December 2021, the Biology and Psychobiology programmes of the University of Amsterdam were assessed by an independent peer review panel as part of the cluster assessment Biology. The assessment cluster consisted of 21 programmes, offered by Utrecht University, Radboud University, the University of Groningen, Leiden University, the University of Amsterdam and Vrije Universiteit Amsterdam. The assessment followed the procedure and standards of the NVAO Assessment Framework for the Higher Education Accreditation System of the Netherlands (September 2018).

Quality assurance agency Academion coordinated the assessment upon request of the Biology cluster after taking over from Qanu per August 2021, when the first site visit to Utrecht University had already taken place. Els Schröder acted as coordinator for Qanu during the start-up phase and the site visit to Utrecht University. From then on, Fiona Schouten and Peter Hildering acted as coordinators and secretaries in the cluster assessment, and Mariëlle Klerks acted as secretary. They have all been certified and registered by the NVAO. For the University of Amsterdam, Peter Hildering acted as coordinator and Mariëlle Klerks as secretary.

Preparation

Qanu composed the peer review panel in cooperation with the institutions and taking into account the expertise and independence of the members as well as consistency within the cluster. On 22 June 2021, the NVAO approved the composition of the panel. The coordinator instructed the panel chair on 7 April 2021 on his role in the site visit.

The contact persons for the University of Amsterdam composed a site visit schedule in consultation with the coordinator (see appendix 3). They selected representative partners for the various interviews. It was determined that the development dialogue would take place after the site visit. A separate development report was made based on this dialogue.

The programmes provided the Qanu coordinator with a list of graduates over the period 2019-2020. In consultation with the coordinator, the panel chair selected 15 theses per programme. He took the diversity of final grades and examiners into account, as well as the various specializations. Prior to the site visit, the programmes provided the panel with the theses and the accompanying assessment forms. They also provided the panel with a self-evaluation report and additional materials (see appendix 4).

The panel members studied the information and sent their findings to the secretary. The secretary collected the panel's questions and remarks in a document and shared this with the panel members. In a preliminary meeting, the panel discussed the initial findings on the self-evaluation reports and the theses, as well as the division of tasks during the site visit. The panel was also informed on the assessment framework, the working method and the planning of the site visits and reports.

Site visit

The site visit was organized online. During the site visit, the panel interviewed various programme representatives (see appendix 3). The panel also offered students and staff members an opportunity for confidential discussion during an online consultation hour. No consultation was requested. The panel used

the final part of the site visit to discuss its findings in an internal meeting. Afterwards, the panel publicly presented the preliminary findings.

Report

The secretary wrote a draft report based on the panel's findings and submitted it for peer assessment to the coordinator. Subsequently, the secretary sent the report to the panel for feedback. After processing this feedback, the coordinator sent the draft report to the Faculty of Science of the University of Amsterdam in order to have it checked for factual irregularities. The secretary discussed the ensuing comments with the panel chair and changes were implemented accordingly. The panel then finalized the report, and the coordinator sent it to the University of Amsterdam.

Panel

The following panel members were involved in the cluster assessment:

- Prof. dr. Ton Bisseling, professor emeritus Molecular Biology at Wageningen University & Research (chair);
- Em. prof. dr. Nico van Straalen, professor emeritus of Animal Ecology at Vrije Universiteit (vice-chair);
- Prof. dr. Aard Groen, professor of Entrepreneurship & Valorization at University of Groningen;
- Prof. dr. Menno Witter, Professor of Neuroscience at Norwegian University of Science and Technology;
- Prof. dr. Ellen Blaak, Professor of Human Biology at Maastricht University;
- Prof. dr. Roos Masereeuw, professor of Experimental Pharmacology at Utrecht University;
- Prof. dr. Sander Nieuwenhuis, professor Cognitive Psychology at Leiden University;
- Prof. dr. Maarten Frens, professor in Systems Physiology at Erasmus University Rotterdam;
- Prof. dr. ir. Jan Kammenga, professor of Functional Genetics at Wageningen University & Research
- Prof. dr. Dennis Claessen, professor Molecular Microbiology at Leiden University;
- Prof. dr. Isa Schön, team leader at the Royal Belgian Institute of Natural Sciences and guest professor at Hasselt University, Natural Sciences, Centre of Environmental Sciences;
- Prof. dr. Hauke Smidt, professor Microbial Ecology at Wageningen University & Research;
- Prof. dr. ir. Wim Petegem, professor in Engineering Education at the unit Engineering Technology Education Research (ETHER) of KU Leuven;
- Dr. Frank van der Wilk, executive director Netherlands Commission on Genetic Modification;
- Dr. Mariken de Krom, head team Education and Research (Brain Division) at UMC Utrecht;
- Dr. Mieke Latijnhouwers, assessment expert at Education Support Office of Wageningen University & Research;
- Ir. Eric Schouwenberg, head of department Nature and Biodiversity at Arcadis;
- Dr. Peter Korsten, researcher and lecturer in Behavioural Ecology at Bielefeld University;
- Dr. Éva Kalmár, researcher and lecturer in Science Communication at Delft University of Technology;
- Dr. Mark Bos, researcher and lecturer in Science Communication at Utrecht University;
- Drs. Bas Reichert, founder and CEO of BaseClear (microbial genomics);
- Jelle Keijzer BSc, master student Molecular Cellular Life Sciences at Utrecht University (student member);
- Ishara Merhai, bachelor student Biology at University of Amsterdam (student member).

The panel assessing the MSc Biological Sciences programme at the University of Amsterdam consisted of the following members:

- Prof. dr. Ton Bisseling, professor emeritus Molecular Biology at Wageningen University & Research (chair);
- Prof. dr. Sander Nieuwenhuis, professor Cognitive Psychology at Leiden University;
- Prof. dr. Maarten Frens, professor in Systems Physiology at Erasmus University Rotterdam;
- Prof. dr. ir. Jan Kammenga, professor of Functional Genetics at Wageningen University & Research
- Ir. Eric Schouwenberg, head of department Nature and Biodiversity at Arcadis;
- Jelle Keijzer BSc, master student Molecular Cellular Life Sciences at Utrecht University (student member).

Information on the programme

Name of the institution:	University of Amsterdam
Status of the institution:	Publicly funded institution
Result institutional quality assurance assessment:	Positive
Programme name:	Biological Sciences
CROHO number:	60707
Level:	Master
Orientation:	Academic
Number of credits:	120 EC
Specializations or tracks:	General Biology Ecology and Evolution Freshwater and Marine Biology Green Life Sciences Teaching (major) Science Communication (major) Science in Society (major)
Location:	Amsterdam
Mode(s) of study:	Full-time
Language of instruction:	English
Submission date NVAO:	1 May 2022

Description of the assessment

MSc Biological Sciences, Ecology and Evolution track: cooperation between the University of Amsterdam and the Vrije Universiteit Amsterdam

The Ecology and Evolution track's programme is a cooperation between the MSc Biological Sciences of the University of Amsterdam (UvA) and the MSc Ecology of the Vrije Universiteit Amsterdam (VU; accredited in 2021 within the same assessment group). The specifics of this collaboration are laid down in a collaboration agreement (of which the panel studied a draft version at the time of the site visit). The curriculum is jointly coordinated and offered by the Faculty of Science (FNWI) at UvA and the Faculty of Science at VU Amsterdam. This means that courses and teaching staff are combined. Furthermore, the handbooks of education-related Rules and Regulations (R&R) and Teaching and Examination Regulations (TERs) were aligned.¹ Although the curriculum is jointly offered, it does not lead to a double or joint degree. Students are awarded a degree from the university at which they are enrolled. Moreover, each university remains fully responsible for its programme and its quality assurance.

MSc Biological Sciences: Professional Majors in Teaching, Science Communication, and Science in Society

The MSc offers students the opportunity to follow a societally-oriented major in the second year of the programme. Students may choose between the following three majors: Teaching, Science Communication, and Science in Society. These are faculty-wide majors offered by most of the master's programmes within the FNWI, with participants from multiple MSc programmes. The major Teaching is offered by the Interfacultaire Lerarenopleidingen (ILO) at the UvA and overlaps with the curriculum of the MSc Leraar Voorbereidend Hoger Onderwijs in de Bètawetenschappen (ISAT 68533; accredited in 2021). The major Science Communication and the major Science in Society are both offered by the Athena Institute, a research and education department within the Faculty of Science at VU Amsterdam. Students in these majors follow the cursory programme of the first year of the two-year master's programme Management Policy Analysis and Entrepreneurship in the Health and Life Sciences (MPA, ISAT 6080; accredited in 2019). To prevent repeated accreditation of these majors in all associated MSc programmes, the majors (including the major-specific final projects) are assessed during the accreditations of the respective MSc programmes in which the majors are incorporated. The remainder of this report will only discuss these majors in general terms. For an in-depth assessment, please refer to the relevant accreditation reports.

Standard 1. Intended learning outcomes

The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

Findings

The MSc Biological Sciences is offered by the Faculty of Science (FNWI) of the University of Amsterdam (UvA) and is a two-year English-taught master's programme. The programme intends to equip students with a deep knowledge of and fundamental insights into Biological Sciences. It also aims to provide an overview of complex biological systems that will help students to tackle major societal challenges. In addition, students are equipped with academic and professional skills through opportunities to conduct empirical research. The programme aims to train students to become skilled research professionals who are well versed in current scientific knowledge and who can apply this knowledge independently in new and continuously

¹ In fact, the coordination between UvA and VU Amsterdam on the handbooks of education-related Rules and Regulations (R&R) and Teaching and Examination Regulations (TERs) took place at university-wide level during the discussions about a possible merger of the two universities. The merger, however, never came to fruition.

changing practical situations. It is the programme's ambition to educate biologists qualified for academic positions worldwide or careers in research or in professional fields outside research (e.g., in policy/administration, management, industry, education, or communication) in the domain of biology or in other relevant fields.

The programme contains four research-oriented tracks that strongly reflect the research carried out at the Institute for Biodiversity and Ecosystem Dynamics (IBED) and the Swammerdam Institute for Life Sciences (SILS). These four tracks address several core disciplines of New Biology, and all provide research-based training strongly related to resolving societal issues relevant to one or more of the Dutch top sectors.

1. The Ecology and Evolution (E&E) track focuses on teaching the ecological and evolutionary processes that underpin the development of sustainable agriculture, the evolution of resistance, nature conservation, and ecological risk assessments. As described above, the E&E track's programme is offered in cooperation with the MSc Ecology programme at VU Amsterdam. The E&E track is strongly linked to IBED and the top sector Agriculture and Food.
2. The Freshwater and Marine Biology (FMB) track focuses on both freshwater and marine ecosystems and the integration of disciplines relevant to aquatic ecosystems. This track is closely connected to IBED's Department of Freshwater and Marine Ecology (FAME) and to the top sector Water Industries.
3. In the Green Life Sciences (GLS) track, students are stimulated to develop an integrated view of plant functioning. The track is supported by research groups from both SILS and IBED on plant biology. The track relates to the top sectors of Horticulture and Starting Materials and Agriculture and Food.
4. The General Biology (GB) track offers students ample opportunities to design their own curriculum. Courses and projects are freely selected from the other tracks of the MSc programme. Students are, however, directed towards research, for instance, in topics associated with the Amsterdam Microbiome Initiative, Bacterial Cell Biology & Physiology Groups, and Molecular Biology and Microbial Food Safety at the UvA. The track relates to the top sector Life Sciences and Health.

After the first year, students are offered the opportunity to further specialize through track-specific course components (e.g., courses, research projects) or to broaden their knowledge and skills by choosing one of the following options:

1. One of the three majors (60 EC each). The major Teaching prepares students to become biology teachers at secondary schools and in (higher) vocational education. The major Science Communication prepares students for a role in communication between the science sector and other societal sectors. The major Science in Society trains students in skills such as reading and writing policy advisory reports, management, leadership, and organisation. This major is meant for students with a broad interest in current affairs, social issues, policy, management, and entrepreneurship.
2. The minor Tesla (30 EC) trains students in complex consultancy projects that combine science with a business or with societal challenges (cf. Standard 2).
3. Student labs offer students an inter- and transdisciplinary research environment where students address problems of external parties (cf. Standard 2).

The panel appreciates the clear profile of the programme. The four tracks are very well-defined and are firmly connected to the research foci of the research institutes. The tracks provide an excellent foundation for students who wish to continue their studies with a PhD and pursue a scientific career. At the same time, the three majors, the Tesla minor, and the student labs also serve those students who wish to prepare for a career outside the academic world. The panel considers the attention the profile has for applied contexts highly relevant since about 50% of the alumni find employment in non-academic positions. The panel is very pleased with the broad spectrum of possibilities (research-oriented and more societally-oriented) the profile provides.

The programme's intended learning outcomes (ILOs) are well-formulated and sufficiently concrete. They are formulated along the lines of the Dublin descriptors, thus clearly reflecting the master's level. The ILOs are also well-aligned with the programme's profile. They consist of a set of general ILOs that apply to all four tracks and some additional track-specific (or major-specific) ILOs regarding the more specialized knowledge and skills of the sub-area in question. The Tesla minor has some additional ILOs. The ILOs of the four tracks clearly demonstrate the programme's research orientation as well as its attention to the application of scientific knowledge to practical situations and societal issues. The additional Tesla minor ILOs contain some extra qualifications regarding information processing, teamwork, project work communication, and self-reflection. Furthermore, the programme's ILOs tie in well with the Domain-Specific Framework of Reference (26 June 2020) and correspond to the demands of the *Sectorbeeld Biologie* policy paper. The panel noted that ILO 1m addresses scientific integrity. However, the panel is of the opinion that this aspect needs more elaboration. The panel, therefore, suggests integrating ethics, integrity, and adherence to the scientific code of conduct more firmly into the ILOs.

The panel learned, to its satisfaction, that the MSc is advised by two Advisory Boards: one representing the academic professional field (with members from the field affiliated with various universities) and one representing the non-academic professional field (with members in non-academic positions at relevant organizations). The Advisory Boards provide the programme with solicited and unsolicited advice on matters related to the connection of the programme to the professional fields, each from its own perspective. The panel is very pleased with the effort the MSc makes to bring in external perspectives in a structured way in order to keep the programme optimally attuned to the developments, wishes, and needs of both professional fields.

Considerations

The panel appreciates the programme's clear profile. The four tracks are very well-defined and clearly reflect the research orientations of IBED and SILS. The panel is also pleased with the broad spectrum of possibilities the profile offers. In addition to research-oriented specialization, students are able to broaden their knowledge and skills through more societally-oriented components. The ILOs are in line with the programme's profile and consist of both generic ILOs and track- and major-specific ones, as well as some additional ILOs for the Tesla minor. The ILOs are well-formulated and sufficiently concrete, and they reflect the Dublin descriptors for the master's level. They tie in well with the Domain-Specific Framework of Reference (26 June 2020) and correspond to the demands of the *Sectorbeeld Biologie* policy paper. The panel suggests integrating ethics, integrity, and adherence to the scientific code of conduct more firmly into the ILOs. The panel is very pleased with the two Advisory Boards as they can help the programme to stay up-to-date and attuned to the wishes and needs of both the academic and the non-academic professional fields.

Conclusion

The panel concludes that the programme meets Standard 1.

Standard 2. Teaching-learning environment

The curriculum, the teaching-learning environment, and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

Findings

Curriculum

The curriculum (120 EC) consists of three basic components: courses, a literature review, and research projects. Depending on the track, courses may be compulsory, part of a constrained list, or free electives. For all tracks, the Literature Review (12 EC) is an obligatory part of the curriculum and serves as the final project for programme completion. Students undertake a detailed study of the recent literature on a chosen subject within the scope of their track and write a literature review. The Research Project is a compulsory component of the curriculum. All regular students need to complete two research projects (each with a minimum of 30 EC and a maximum of 60 EC). Students choose a subject and design and carry out the project under the supervision of the research staff. During the process, they gain experience working independently as a scientific researcher. The first research project is usually carried out at IBED or SILS or at closely associated research institutes (track-specific). The second research project, however, is preferably carried out at an external institute in the Netherlands or abroad. The second research project is the second final project for students in the research-oriented tracks. Consequently, the subject of the second research project needs to be more complex than that of the first one, and students are expected to demonstrate more independence in designing and carrying out the project. Furthermore, students of all tracks take two elective courses (1.5 EC each) in professional skills in year 1 and year 2.

Within these fixed confines, students have considerable freedom in designing their own study trajectories. Generally, however, the first year is filled with compulsory courses (6–18 EC), elective courses (max. 15–18 EC), the first research project (at least 30 EC), and, if possible, the literature review. The second year is filled with the second research project, the literature review (if not completed in year 1), and additional elective courses if needed or desired. Students who have completed the first research project and the literature review before the start of the third semester may choose to follow one of the three majors. In that case, they continue their studies in their second year with the curriculum of the chosen major (courses and a research project). Students who manage to accomplish their second research project and literature review before the start of the fourth semester may also choose to do the Tesla minor (30 EC). The student's individual study trajectory is laid down in a study plan at the beginning of the programme (cf. Student guidance and feasibility).

The panel studied the curricula of the various tracks offered within the programme and concluded that the ILOs are adequately covered. The basic design of the curriculum is clear and well-structured. In all tracks, the courses are offered in the first semester, and the research projects and literature review follow in the next semesters. In this way, students can use what they have learned during the courses directly in their projects. All tracks begin with an obligatory track-specific introductory course. Students on the GB track choose the first course of one of the other tracks. This introductory course offers the students the opportunity to get to know each other and to get on the same page. As students come from various (international) universities, the panel thinks this is a beneficial choice as it builds social cohesion.

The panel appreciates that the curriculum is clearly based on the research focal points of IBED and SILS. In the E&E track, which is offered in cooperation with VU Amsterdam, the research expertise of the VU Amsterdam researchers is clearly recognisable as well. The panel is satisfied to see that in the courses,

current developments, cutting-edge theory, and recent breakthroughs are discussed. Research and education are knit tightly into the programme, creating a learning environment that familiarizes students with ongoing research and allows them to take their first steps in research. The panel appreciates the strong focus on fundamental research, with the literature review and the two substantial research projects that can be even prolonged if students wish to do so. This offers students excellent opportunities to challenge themselves to work on complex problems and to prepare for a PhD trajectory. The panel noted to its satisfaction that, in line with the advice of the previous accreditation panel, New Biology has been adequately integrated into the curricula of all tracks. Furthermore, the panel is positive about the way statistics and bioinformatics are integrated into the curriculum and embedded in various components. In the FMB track, the integration of statistics and bioinformatics could still be further improved. During the site visit, the Programme Committee (PC) explained that support in bioinformatics and statistics in the FMB track is, however, informally offered in student circles, but that it could, indeed, be more formally integrated into the courses. The panel is also very pleased with the academic skills training in the programme. Although there are some differences between the four tracks, the panel notes that in all tracks, academic skills training is present across many courses. The E&E track, in addition, offers a scientific writing course (3 EC) during the entire first year, which students consider to be very useful. This course is also open to students of the GB track. Moreover, the panel is also very satisfied with the attention paid to professional and soft skills training. Students can choose two courses from a list of professional skills training elective courses (e.g., Effective Communication and Presentation, Project Management). This offers students the opportunity to choose courses that best fit their needs.

In the panel's view, a particularly strong aspect of the programme is the opportunities it offers to students to broaden their knowledge and skills by integrating more societally-oriented components into the curriculum. Next to the majors in Teaching, Science in Society, and Science Communication, the Tesla minor is an excellent way to do this. In this faculty-wide minor, students work in small, interdisciplinary groups on complex real-world issues for a company or a societal organization. These projects need to be approved beforehand, partly to monitor their correspondence to the academic master's level. Through courses, training, and workshops, students learn more about how to take up such a challenge and work on developing personal and professional skills (e.g., client interaction, complex problem-solving, and efficiency), which are also helpful skills for their project work. The programme also offers opportunities for students to gain experience working in more applied settings. This is done through the student labs that students can choose as electives. In a student lab, master students work on a real-life societal research question from an external party. The students work with academic bachelor students, bachelor students from universities of applied sciences (hbo), and students pursuing vocational secondary education (mbo). The Green Student Lab specifically focusses on issues coming from the field of plant breeding, while the newly installed Sustainable Student Lab focusses on societal issues related to sustainability. During the site visit, the panel discussed both the Tesla minor and the student labs with the lecturers. The lecturers told the panel that both initiatives developed from the ambition to realize a better connection between science and society that aligns with the demands of the *Sectorbeelden* and the advice of the previous accreditation panel. The student labs were a co-creation with a number of external partners with whom the programme has a long-term research relationship. This relationship is now also used in a different way to the benefit of all parties concerned. The panel applauds these initiatives. Both the Tesla minor and the student labs mimic real applied work contexts, offering students a good impression of work in the professional field. Furthermore, the applied contexts also stimulate students to process theoretical knowledge in a different way. With respect to the student labs, moreover, the panel wishes to commend the programme on the diverse composition of the student groups. This diverse composition reflects the actual composition of teams in non-academic professional contexts and offers students the opportunity to benefit from diverse sets of competencies and, at the same time, trains students in developing their teamwork skills.

During the site visit and in the Student Chapter, students were highly appreciative of the freedom and flexibility the programme offers.

The panel concludes that a true asset of the MSc curriculum is that it combines two well-worked out possible study paths. The first is a highly research-oriented curriculum with two substantial research projects which can even be prolonged. The second, when opted for, is a major, the Tesla minor, or student labs, which are a more societally-oriented study path, yet grounded in sound and fundamental research.

Teaching methods and the impact of COVID-19

The MSc programme is characterized by a small-scale research-based teaching-learning environment, which is very much appreciated by the students. The panel is of the opinion that the programme uses adequate and sufficiently varied teaching methods. For the courses, lectures and seminars are used to introduce theory and recent developments. These teaching methods are complemented by small-scale teaching methods, such as interactive teaching in small groups, discussion meetings, and presentations. Besides that, lab work, fieldwork, computer lab activities, and excursions are used to develop students' practical skills. At the same time, the literature review, assignments, and mini-projects support the development of analytical and writing skills. Most of the teaching time in the curriculum, however, is spent on the research projects, for which the didactical approach is the highly student-centred master-apprentice model.

The COVID-19 pandemic impacted the courses, the teaching methods, and the research projects in various ways. During the lockdowns, lectures on campus were replaced by online alternatives. Furthermore, due to the group size restrictions imposed by the Dutch government, lab capacity was reduced. In order to facilitate study progress on the research projects, lab work was allowed to be replaced by data analyses or modelling. Furthermore, students were encouraged to put their research projects on hold and, instead, do their literature reviews first in order to prevent the unnecessary loss of time. Unfortunately, however, these adaptations could not fully avoid study delays. The programme has been very active in monitoring the impact of the COVID-19 pandemic on the students and on teaching and learning. This monitoring has, for instance, taken the form of student surveys and online question-answer sessions with students. The panel appreciates the fact that the programme also had adequate consideration for the impact on students' wellbeing. The students told the panel that they were very positive about the flexibility and proactivity of the programme during these challenging times. They appreciate the efforts lecturers made to make the best of the online teaching sessions, sometimes in very creative ways. The panel commends the programme for the efforts made to keep the negative impact of the pandemic as small as possible.

Student guidance and feasibility

Admission to the programme takes place according to the admission requirements laid down in the MSc's Teaching and Examination Regulations (TER), Part B. The programme is open for students with a bachelor's degree in biology from a Dutch university or an equivalent degree. Incoming students are selected based on prior education, motivation, the Bachelor's grade point average and study duration, Bachelor's thesis length and subject, and English language proficiency. Furthermore, for each track, there are some additional track-specific criteria. Students with deficiencies in their backgrounds who still wish to enter the MSc programme may be admitted to a pre-master's trajectory. To assure that the capacity is not exceeded, the admissions committee can rank and select students based on specific criteria laid down in the TER. Yearly, about 27% of the incoming students come from abroad.

In the MSc programme, student guidance related to planning, curriculum contents, subjects of projects, research interests of staff, and study progress is offered by the track coordinators and mentors. The track coordinator helps students define their study plan. Each student's study plan maps out their curriculum

choices and needs to be approved by the Examination Board. Furthermore, it is also the track coordinator who approves proposals for the literature review and the research projects. Given the small-scale learning environment, students can also easily contact their lecturers in case of questions. In addition, for problems at a more personal level, students can contact the student advisor. In the Student Chapter and during the site visit, the students told the panel that they highly appreciate the kind and supportive atmosphere in the MSc programme. Students are pleased with the approachability of their lecturers and the quick responses to emails. Information on the three societally-oriented majors and about studying abroad, however, is somewhat underexposed in the students' view. The panel, therefore, advises the programme to pay more attention to the possibilities the majors offer when designing the study plans, as well as to guidance of students who are considering going abroad.

The procedures for the research projects and the literature review are clearly formulated in the course manual Protocol Research Project Master Biological Sciences (June 2021) and the Assessment Plan Master's Programme Biological Sciences (August 2021). The two documents state that for both the research projects and the literature review, students should receive feedback and support on all aspects of their research from their supervisor on a daily basis. Supervision is also provided by the assessor, who is responsible for the research project of the student and often leads the research into which the student's project is embedded. The assessor is regularly available at all stages of the project to provide the student with support and feedback. Both the daily supervisor and the assessor are FNWI staff members or researchers at the institute or company (with at least an MSc degree) where the research project is performed. The research project or literature review trajectory starts with the project proposal the student writes in consultation with both the envisaged daily supervisor and assessor. Upon approval of the proposal by the track coordinator, the student begins the project literature review. Throughout the trajectory, there are several formal formative assessment moments at which both the daily supervisor and assessor are present and during which progress is discussed and feedback is given. During the site visit, the students told the panel they were satisfied with the guidance and feedback of their supervisors. Their feedback is helpful and often elaborate. Students of the GLS track suggested that some informal sessions could be included during the internships. These sessions would allow students to present their research to their peers and receive feedback. This is already done in the FMB track and helps students to stay in contact with their peers during the relatively long periods of their internships.

Students consider the programme demanding yet feasible. The panel appreciates the (pro)active role the PC plays in addressing issues and safeguarding the quality of the programme. The panel notes, however, that a relatively high number of students do not succeed in completing the programme in two years. The panel discussed this issue with the students and the lecturers. Both groups told the panel that in the majority of the cases, this has to do with the research projects. The students told the panel that it is sometimes hard to plan the projects, for instance, when going abroad. Another aspect relates to the nature of the experiments to be conducted. They may be season-related, which entails waiting for the right period. The lecturers added that the students who wish to continue their studies with a PhD trajectory are very motivated and tend to take more time for their research projects as they want to 'just include that one last experiment'. The lecturers recognize that a longer research project can be helpful in obtaining a PhD position. Nonetheless, the lecturers try to keep students on track. The panel agrees that this is important and advises the programme to continue actively focussing on the timely completion of the research projects.

Language of instruction

The MSc is delivered in English. The panel is of the opinion that this is a good choice given the international orientation of the programme and the research field as well as the global labour market. Furthermore, a substantial part of the teaching staff is non-Dutch, which makes the choice for the English language all the

more obvious. Students feel comfortable with the use of English in the programme. Students coming from UvA's BSc Biologie programme feel well-prepared for an English-language programme since the BSc gradually shifts from the Dutch to the English language during the curriculum. Students who come from other universities must meet the English language proficiency requirements as part of the admission requirements. Moreover, training in academic writing in the various tracks of the MSc also supports students in developing their English writing skills. The teaching staff consists of internationally active researchers that communicate in English on a daily basis. For new teaching staff members, English-language proficiency is one of the selection criteria.

Teaching staff and facilities

The panel is of the opinion that the teaching staff have the adequate qualifications needed to deliver the programme. Almost all teaching staff are actively involved in the research of IBED and SILS and, thus, cover the expertise needed to offer the various tracks. Staff are also didactically skilled. At the time of the visitation, 92% of the teaching staff held a basic teaching qualification (BKO) or were in the process of acquiring such qualification, while 10% held a senior teaching qualification (SKO). For the E&E track, the teaching staff consists of the combined staff from UvA's FNWI and from the Faculty of Science at VU Amsterdam, which gives students access to an even larger network of researchers in the field. Each university is responsible for the quality of its own staff, but the quality of teaching staff is comparable and is assured in the context of their respective accreditations. The collaboration functions smoothly, and students hardly even realize whether a lecturer is from UvA or VU Amsterdam. In order to monitor the quality of the curriculum and teaching-learning environment, regular staff meetings are organized within tracks. Each semester, track-coordinators meet with the programme director, the programme coordinator, and the study advisor. The panel has seen enthusiastic and dedicated teaching staff.

Professionalization opportunities for the teaching staff are offered by the Teaching and Learning Centre (TLC). Besides staff professionalisation training, the TLC actively stimulates and initiates innovations in teaching and the exchange of knowledge and best practices. The lecturers told the panel that, during the COVID-19 pandemic, the TLC has played an important supportive role in the switch-over to hybrid and online teaching and the development of new teaching methods.

Over the past six years, the student-staff ratio has remained below 22, which the panel considers to be appropriate. The teaching staff confirmed that, generally, the workload related to this MSc programme was manageable. Due to the pandemic, however, the staff experienced an increased workload. Additional time was needed to develop alternative teaching methods, and students needed more guidance. During the site visit, students were highly appreciative of their lecturers and supervisors. Students feel that they are very supportive, especially given the uncertainty during the COVID-19 pandemic.

As the visitation took place online due to the restrictive COVID-19 regulations of the Dutch government at the time, the panel could not assess the quality of the (lab) facilities. However, based on the descriptions in the documentation, students' feedback, and the fact that the facilities are tied to the IBED and SILS research institutes, the panel is confident that the facilities are adequate.

Considerations

The panel highly appreciates the curriculum of the MSc Biological Sciences programme. The curriculum's basic design is clear and well-structured and offers students considerable freedom in designing their own study trajectory. The curriculum adequately covers the ILOs (for all tracks under review), is feasible and up-to-date, and features a good integration of New Biology, statistics, and bioinformatics. The panel is also pleased with the attention paid to academic, professional, and soft skills training throughout the curriculum.

The curriculum is clearly based on the research foci of IBED and SILS, and research and education are tightly-knit. The panel appreciates the strong emphasis on fundamental research. The literature review and the two substantial research projects, which can be prolonged, provide ample opportunity for students to conduct in-depth and varied research in the field. This offers students excellent opportunities to prepare for a PhD trajectory. Another particularly strong aspect of the programme is the opportunities it offers students to integrate societally-oriented components, such as a major, the Tesla minor, and the student labs. The panel specifically applauds these last two initiatives since they offer students a very good impression of working in non-academic professional work contexts. In the panel's view, the combination of these two well-organized study paths, a highly research-oriented one and a societally-oriented one grounded in a sound fundamental basis, is a true asset of the programme. The panel is, furthermore, pleased with the small-scale, varied teaching methods and the master-apprentice approach used for the research projects. The teaching staff have the proper qualifications needed to deliver the programme. Students of all four tracks under review are adequately supported and guided. The information provided on the majors and about going abroad could, however, be improved. Students highly appreciate the kind and supportive atmosphere in the programme and praise their lecturers for their approachability, enthusiasm, and dedication. The panel commends the staff for their efforts during the pandemic. The (lab) facilities are adequate.

Conclusion

The panel concludes that the programme meets Standard 2.

Standard 3. Student assessment

The programme has an adequate system of student assessment in place.

Findings

Assessment takes place according to the regulations laid down in the assessment policy of the UvA and the document Assessment Plan Master's programme Biological Sciences (August 2021), which is the practical implementation of this policy. Important guidelines for assessment in the MSc programme are the principles of constructive alignment (i.e., learning objectives, teaching methods, and assessment are aligned) and teamwork to guarantee the consistency, validity, and reliability of assessment.

The curriculum and assessment outlines for the programme are described in its Teaching and Examination Regulations (TER). The programme's assessment plan offers an overview of the relationship between the learning objectives of the courses and the ILOs of the programme. For each programme component (i.e., course, research project, or literature review), the course descriptions in the study guide contain information on the learning objectives, teaching methods, and the assessment (formative and summative) forms used.

The panel has studied the TER, the learning objectives and ILOs overview in the assessment plan, the information on assessment in the course descriptions in the study guide, and a selection of assessments and the corresponding grading forms. Based on this information, the panel concludes that assessment in all the tracks under review adequately covers the learning objectives and ILOs. The panel is of the opinion that the quality of assessment in the MSc programme is adequate. It is generally valid, reliable, and transparent. During the site visit, the students stated that assessment in the programme is transparent. Students are informed beforehand on how exams take place and what is expected from them, for instance, via mock exams. They also consider grading to be fair and are very satisfied with the large amount of feedback they receive from their lecturers along the way. The panel commends the programme on the attention it pays to

providing feedback, as it considers this to be very important for students' learning. It also wishes to compliment the programme on the good quality of its grading rubrics.

The panel is positive about the assessment methods used in the MSc programme. For the assessment of courses, the programme aims for the use of a mix of assessment methods. Therefore, the summative assessment is often subdivided into two or more partial assessments of different types (e.g., written reports, presentations, practical workshops, or exams). In the Student Chapter, students state that they appreciate the fact that the final grade for a course does not solely depend on the exam but on a mixture of varied assessment methods. Furthermore, the panel considers the literature review a very valuable exercise. During the pandemic, exams sometimes needed adjustments, and the order of exams could be adapted to meet the individual needs of students. Students appreciate the efforts made by the programme to facilitate study progress in these trying times.

Assessment of Tesla minor

Assessment within the Tesla minor consists of projects in which students develop a solution for complex real-world issues for a company or a societal organization. The projects are conducted in small, interdisciplinary groups. The panel studied three projects (nine students in total) of the Tesla minor. In the panel's view, these projects demonstrate how valuable this minor is. The projects deal with very interesting research questions. Although the academic level of the projects is checked beforehand, the panel concludes that the academic level still varies. Nonetheless, all the Tesla projects studied clearly demonstrate the achievement of the minor-specific ILOs, such as self-reflection, communication skills, team and project work skills, and information processing skills. The panel noticed that examiners do not differentiate between individual students within a project group. The panel, however, thinks that the assessment should also take the individual contributions of students into account. It discussed this with the Examination Board, which told the panel that it shares the panel's view and is already involved in a discussion to improve this. The panel understands that this is a topic to be discussed within the faculty since the Tesla minor is offered at the faculty level. The panel supports the Examination Board in its efforts to change the situation and strongly encourages the Tesla minor to develop an assessment method for projects that recognizes individual contributions by the students.

Final projects

Students in one of the research-oriented tracks complete the MSc programme with the literature review and the second research project as final projects. Students that follow one of the majors complete the first year of their curriculum with the literature review and the first research project, and the second year with a final project specific to their major.

Whereas the first research project generally takes place within IBED or SILS, the second research project is preferably carried out at an external institute (e.g., another university, a research institute, or a company) in the Netherlands or abroad. Both the literature review and the research project start with the writing of a (research) proposal. Upon approval of the proposal by the track coordinator and a kick-off meeting with the daily supervisor, the assessor, and the examiner, students begin work on their research project or literature review. The assessor and the FNWI-appointed examiner are responsible for the summative assessment of the literature review and the research project. The assessor has ample experience in supervision and assessment of student projects but is not necessarily an FNWI staff member (cf. Standard 2, Student guidance and feasibility). The examiner, however, is a BKO-certified FNWI staff member who is appointed as an examiner for research projects by the Examination Board.

For the literature review, the final report is assessed by both the assessor and the examiner. The final grade is calculated as the mean of the grades of the assessor and the examiner. For the research projects, students are assessed by the assessor (with advice from the daily supervisor) on three elements: 1) the practical work/research (60%), the written report (30%), and 3) the oral presentation (10%). At the time of the site visit, only the written report was independently assessed by the examiner. The panel believes that it would be beneficial to have the oral presentation assessed by the examiner as well. The final grade for the report is calculated as the mean of the grades of the assessor and the examiner. The examiner checks the final report for plagiarism. The final grade for the research project is the weighted average of the grades for each of the three elements and must not be lower than 5.5. The individual grades for the practical work/research, presentation, and report must not be lower than 5. In case the assessor and the examiner differ strongly in their assessment, they discuss the marks to reach consent. This applies to both the literature review and the research projects.

The panel is of the opinion that the literature review and research project assessment procedures are well-designed. The panel has studied a representative selection of both types of final projects of all four tracks under review. Only in one case (a research project), the panel did not agree with the programme on the final grade awarded, as it was not in correspondence with the calculation rules for the final grade. The Examination Board confirmed that in that particular case, an error had been made. The panel considers this to be an incident that is not representative of the assessment procedures followed by the programme. The panel is very positive about the quality of the grading forms and the rubrics used for the research projects and the literature review. It also appreciates the way everything is documented and recorded in the digital programme information system DataNose. The panel is surprised, however, about the fact that written feedback and the substantiation and motivation behind the final grade are only required if the grade is equal to or higher than 8. This is the case for both the research projects and the literature review. In view of the reliability and transparency of the assessment, the panel recommends the programme to see to it that sufficient written feedback and substantiation of the assessment (even in cases with grades lower than 8) is *always* provided.

Quality Assurance and Examination Board

The panel concludes to its satisfaction that the assessment plan contains important guidelines to assure the quality of assessment in the MSc programme:

1. The use of examiners appointed by the Examination Board based on specific criteria;
2. The use of test matrices;
3. The use of answer models and assessment models;
4. The practice of *peer review* in the construction of tests and the use of the four-eye-principle in the assessment of research projects and the literature review;
5. The use of rubrics to assess tests other than written exams (e.g., academic skills, projects, and presentations); and
6. The use of course records containing all relevant assessment information about the courses, such as the course manuals, exams, rubrics, answer models, test matrices, and peer review reports.

The FNWI has various examination boards and associated subcommittees. The Examination Board for Earth and Life Sciences (EC-ALW) is responsible for safeguarding the quality of assessment in the MSc programme. The EC-ALW consists of a chair, a vice-chair, and an external member. At least one of the members is a lecturer in one of the programmes for which the EC-ALW is responsible. For the Biological Sciences programmes (MSc and BSc), the EC-ALW has installed a subcommittee that has been mandated with performing some of the EC-ALW's tasks. The Biological Sciences Subcommittee consists of a chair and two members.

The panel is of the opinion that the EC-ALW has formulated a solid procedure for safeguarding the quality of assessment. At the end of each semester, the subcommittee evaluates the assessment of a selection of courses and projects offered in that semester. If any irregularities are identified with respect to the assessment of a course or project (e.g., complaints or very high or low success rates), these courses and projects are included in this selection. Suggestions for improvement are discussed with the coordinator of the course and implemented before offering the respective course or project again. Annually, the assessment of 10% of the courses and projects is evaluated. The evaluations are based on the information in the course records. Furthermore, the subcommittee also evaluates a selection of research projects and literature reviews each year. The panel is of the opinion that the EC-ALW (and the Biological Sciences Subcommittee) does an excellent job of safeguarding the quality of assessment and the final attainment level of the programme. The panel was also pleased to hear that the EC-ALW closely monitors the academic level of the courses that are also open to students coming from other universities and programmes.

Within the context of the cooperation with VU Amsterdam, the EC-ALW works together with the VU Amsterdam Examination Board on the basis of mutual transparency and trust. The examination boards have formal contact yearly to discuss topics such as the quality assurance of assessments and research projects and the exchange procedures for the courses offered at each university. This is important for remaining informed about the procedures and methods at the other university. Considering that the TERs and R&Rs are also coordinated at the university level, the panel acknowledges the merits of this hands-on approach. For final projects in the E&E track conducted at VU Amsterdam, a UvA examiner is always involved in the assessment to safeguard the link to VU Amsterdam. For the majors, the EC-ALW determines whether each student is qualified to follow a major and whether the major programmes are accredited within the accreditation procedure of the programme in question. Quality assurance of assessment within the majors is performed by the Examination Boards of the associated MSc programmes. The panel is satisfied with these arrangements, although it thinks the EC-ALW could invest in a more structural relationship with the Examination Boards that carry out the quality assurance of these programme components on behalf of EC-ALW. This could, for instance, take the form of contact on a regular basis for the EC-ALW to inform itself on relevant findings with regard to the majors.

During the site visit, the EC-ALW told the panel that it missed the expertise of the test expert of the ESC. The test expert has left and has not yet been replaced. Not being able to use the services of a test expert is unfortunate for the lecturers as well, as they now receive less guidance in this particular area. The panel shares the EC-ALW's concerns and hopes the situation will change soon.

During the site visit, the panel also discussed assessment during the pandemic with the EC-ALW and the subcommittee. The panel concludes that the EC-ALW has been very (pro)active in these trying times and has done its best to continue assuring the quality of assessment.

Considerations

The panel concludes that assessment in the MSc Biological Sciences programme is in accordance with UvA's assessment policy and the programme's assessment plan. The assessment for all four tracks under review adequately covers the learning objectives and the ILOs. On the whole, the quality of assessment in the programme meets the standards. The assessment methods are varied and adequate, and elaborate feedback is often provided, which the panel appreciates given the importance of feedback for students' learning. The Tesla projects studied by the panel clearly demonstrate the achievement of the additional Tesla minor ILOs. The panel believes that assessment in the Tesla minor should also take the individual contributions of students into account. The panel supports the Examination Board in its efforts to change the

situation and strongly encourages the Tesla minor to develop an assessment method for projects that recognises individual student contributions.

The panel considers the assessment procedures of the literature review and the research projects well-designed and commends the programme on the high quality of the associated grading forms and the rubrics. For the research projects, the panel recommends that the examiner assess the oral presentation as well. Furthermore, the panel recommends the programme to see to it that sufficient written feedback and substantiation of the assessment (also in cases with grades lower than 8) *always* be provided.

The panel concludes that adequate guidelines are in place to ensure the quality of assessment. Furthermore, the EC-ALW has formulated solid procedures for the evaluation of assessments. The EC-ALW (together with the Biological Sciences Subcommittee) safeguards the quality of assessment and the exit level of students in an excellent way. The panel hopes that a new test expert will be employed soon so that they can support the EC-ALW, the Biological Sciences Subcommittee, and the teaching staff.

Finally, the panel concludes that the cooperation with VU Amsterdam is based on mutual transparency and trust. The panel acknowledges the merits of the hands-on approach, which works well for both parties. This is also the case for the majors, where trust is based on the accreditation of the programmes involved, although the EC-ALW could invest in a more structured relationship with the associated Examination Boards.

Conclusion

The panel concludes that the programme meets Standard 3.

Standard 4. Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings

The panel studied a representative selection of 15 final student projects. This selection consisted of 10 students from the four research-oriented tracks (their literature reviews and second research projects were assessed) and five students from the three society-oriented majors (their literature reviews and first research projects were considered). Based on the selection, the panel concludes that all final projects (except for one research project that was discussed in Standard 3) demonstrate the realization of the programme's ILOs. The final projects are clearly of the level and quality that may be expected from an MSc research project or literature review in the field of Biological Sciences. The projects also clearly reflect the various research interests of the four tracks.

The literature reviews are of good quality and have relevant topics. As for the research projects, the panel concludes that they are often of very high quality. The panel is impressed by the advanced experimental work that is being conducted and by the high-quality discussions of the experimental results. The reports are well-structured; they contain good introductions and clear paragraphs on data management. Many of the reports employ skilled data visualizations. Furthermore, the panel is pleased with the high level of English language proficiency. The overview of peer-reviewed publications with student co-authorship provided in the self-evaluation report confirms the panel's positive judgement of the exit qualifications of the students. These findings apply to both research projects, whereby the panel noticed that the second research projects clearly demonstrated a higher level of academic research and integrative aspects, as well as better analyses, discussions, and recommendations than the first research projects, as intended by the programme.

Alumni were very pleased by the programme, which, in their opinion, prepared them very well for both academic and non-academic professional contexts. Alumni praised the two long research projects that not only provided them with in-depth knowledge on a specific topic but also offered them a rich experience in conducting research. Alumni who continued their studies and went on to earn a PhD felt very well equipped by the research experience they gained during the MSc programme. Alumni who work in a non-academic setting also appreciated the strong research focus of the programme, since the acquired research skills are very valuable in more applied settings as well. This, in the panel's view, validates the value of the two long research projects. Alumni also told the panel that they have the impression that, in comparison with alumni from other programmes, UvA alumni are better prepared when it comes to writing and presentation skills.

Almost all graduates of the MSc programme (95%) find a qualified job within a year after graduation. About 50% of the programme's alumni find PhD positions in the Netherlands or abroad. Another substantial number of alumni find positions in many sectors of society in the Netherlands or abroad (e.g., in policy, consultancy, or commercial research). On the whole, the alumni look back on the programme with great satisfaction and feel the programme prepared them well for their careers.

Considerations

The panel concludes that the final projects of the MSc Biological Sciences demonstrate the realization of the programme's ILOs. They are clearly of the level and quality that can be expected from MSc final projects in the field of Biological Sciences. The projects clearly reflect the various research interests of the four tracks and are often of very high quality. The alumni look back on the programme with great satisfaction and feel that the programme prepared them well for their careers. They find employment in relevant jobs in the Netherlands and abroad, both inside and outside academia.

Conclusion

The panel concludes that the programme meets Standard 4.

General conclusion

The panel's assessment of the MSc Biological Sciences is positive.

Development points

1. The panel suggests integrating ethics, integrity, and adherence to the scientific code of conduct more firmly into the ILOs.
2. The panel advises the programme to improve the information provided on the majors and on studying or doing internships abroad.
3. For the research projects, the panel recommends that the examiner also assess the oral presentation.
4. With respect to the assessment of the research projects and the literature review, the panel advises the programme to see to it that sufficient feedback and substantiation of the assessment *always* (also in cases with grades lower than 8) be provided.

Appendix 1. Intended learning outcomes

1. The graduate of the Master's programme Biological Sciences has [between brackets the most associated Dublin descriptor(s)]:

- a. the ability to read up on and master current scientific research developments and have knowledge of current scientific developments within relevant biological research [Knowledge and understanding];
- b. the analysing, problem-solving and synthesising abilities in order to deal with current scientific knowledge in biology and apply this knowledge in new and continuously changing practical situations, also in broader, multidisciplinary contexts [Applying knowledge and understanding];
- c. both a broad basic biological as well as specialist knowledge of one or more sub-areas of biology, as basis or opportunity for originality in developing and/or applying ideas [Knowledge and understanding];
- d. the ability to formulate questions on the frontline of scientific research [Knowledge and understanding, Applying knowledge and understanding, Making judgements];
- e. the ability to formulate realistic and falsifiable (research)hypothesis, based on incomplete, limited or complex information and translate this into a research proposal [Knowledge and understanding, Applying of knowledge and understanding, Making judgements];
- f. the ability to independently set up and conduct biological experiments and field or laboratory measurements contributing to a line of research [Applying of knowledge and understanding, Learning skills];
- g. the skills to present research plans and results, orally or written, in English, at various scales and levels of abstraction, and communicate these to specialist and non-specialist audiences [Communication];
- h. the skills to analyse and interpret biological patterns and processes in both a qualitative and quantitative sense [Applying of knowledge and understanding];
- i. the ability to get acquainted with a field of study in a short period of time by self-study, to form one's own opinion and to write a critical essay in a set period of time [Making judgements];
- j. the ability to integrate the many hierarchical levels present in biology, and understands the interactions between biological sciences and other sciences [Making judgements];
- k. the ability to successfully fulfil a position in society requiring an academic qualification as an independently operating professional that has a good knowledge base and attitude towards a biological approach to relevant societal issues [Learning skills];
- l. an attitude that enables critical reflection [Making judgements, Learning skills].
- m. is familiar with the rules of scientific integrity and is acting accordingly [Making judgements].

2. In addition to paragraph 1, the student finishing the track Ecology and Evolution has obtained the following track-specific qualifications:

- a. the ability to interpret and evaluate current state-of-the-art research on the role of ecological and evolutionary processes in nature and to start an independent research project in this direction;
- b. has the know-how and research experience to act as a self-directed professional in an environment where understanding of ecological and evolutionary processes is required.

3. In addition to paragraph 1, the student finishing the track General Biology has obtained the following track-specific qualifications:

- a. the ability to interpret and evaluate current state-of-the-art research of various sub-areas of biology, and to start an independent research project in this direction;

- b. has the know-how and research experience to act as a self-directed professional in an environment where integrative understanding of various sub-areas of biology is required.

4. In addition to paragraph 1, the student finishing the track Green Life Sciences has obtained the following track-specific qualifications:

- a. can describe how plants function on a physiological, genetic, biochemical and cellular level and explain how plants respond to biotic and abiotic stress;
- b. can illustrate how plant biotechnology (including “omics”-technologies) and plant breeding can be applied to improve traits;
- c. the ability to interpret and evaluate current state-of-the-art research in experimental plant sciences and to start an independent research project in this direction;
- d. has the know-how and research experience to act as a self-directed professional in an environment where understanding of experimental plant sciences is required.

5. In addition to paragraph 1, the student finishing the track Freshwater and Marine Biology has obtained the following track-specific qualifications:

- a. has basic knowledge of the major physical and chemical processes that affect freshwater and marine ecosystems;
- b. the ability to interpret and evaluate current state-of-the-art research on the functioning of freshwater and marine ecosystems and to start an independent research project in this direction;
- c. has the know-how and research experience to act as a self-directed professional in an environment where understanding of freshwater and/or marine processes is required.

6. In addition to paragraphs 2.2.1 through 2.2.5, the graduate who has chosen to do a second track-specific research project has the ability to continue his/her career either as a researcher able to pursue a PhD degree at the world’s best universities, as a scientist in research institutes worldwide, or as a research-skilled professional in organisations of government, civil society or business and industry.

7. In addition to paragraphs 2.2.1 through 2.2.5, the graduate who has chosen to do a major or minor as mentioned in article B-4.4.2, obtains the exit qualifications as listed in the appendix (OER).

Final attainment levels of the major Science in Society, the major Science Communication, the Major Teaching and the Minor Tesla

A. Final attainment levels of the major Science in Society

Dublin descriptor 1: Knowledge and understanding

The graduate has theoretical and practical knowledge of management, policy analysis and entrepreneurship. The graduate:

1. has insight into the various relevant disciplines in the social and behavioural sciences. More specifically the student acquires insight into: a. important concepts and theories in the field of policy science, management studies, and entrepreneurship; b. the relation of these gamma sciences to the beta sciences;
2. has insight into concepts and the latest theories, research methodologies, analytical models and important research questions related to interdisciplinary research for addressing societal problems;
3. has knowledge of, and insight into, relevant concepts and theories for effective communication and collaboration.

Dublin descriptor 2: Applying knowledge and understanding

The graduate is experienced in carrying out interdisciplinary research, in applying techniques specific to the subject area and in applying scientific knowledge to societal problems. The graduate:

1. has the ability to integrate knowledge from the beta and gamma sciences, as well as from science and practice;
2. can apply scientific knowledge to formulate solutions to societal problems and assess them for appropriateness and societal relevance;
3. adopts an appropriate attitude towards the correct and unbiased use and presentation of data.

Dublin descriptor 3: Making judgments

The graduate is able to independently and critically judge information. The graduate is able to:

1. independently acquire information in relevant scientific areas through a literature review and by conducting empirical research, as well as evaluate such information critically;
2. select and order information, distinguish essentials from trivialities, and recognize connections;
3. formulate personal learning objectives and critically evaluate own performance, both introspectively and in discussion with others.

Dublin descriptor 4: Communication

The graduate is able to transfer knowledge and skills related to his/her subject area to other people and to adequately reply to questions and problems posed within society. The graduate:

1. has acquired skills to report orally and in writing on research results in English;
2. has the ability to communicate research conclusions, and the knowledge and rationale underpinning them, to specialist audiences and non-specialist audiences clearly and unambiguously;
3. can collaborate with researchers from various scientific disciplines;
4. can make essential contributions to scientific discussions about plans, results and consequences of research.

Dublin descriptor 5: Learning skills

The graduate has developed learning skills that enable him/her to continue with self-education and development within the subject area. The graduate:

1. has acquired skills to develop a research plan, giving details of the problem statement, objectives, research questions, research approach, research methods, and planning;
2. is familiar with the general scientific journals, such as Nature and Science, and with journals in the specialisation, such as Research Policy, Health Policy, Science, Technology & Human Values, Social Science & Medicine, and International Journal on Technology Management;
3. has the learning skills to allow him/her to continue to study in a manner that may be largely self-directed or autonomous (life-long learning).

B. Final attainment levels of the major Science Communication

The MSc graduate possesses an academic attitude, skills and competences to operate at the interface of science and society aiming to contribute to a fruitful science-society dialogue. This means that Master's graduates have the following focus:

- Understanding the dynamic relationship between science and society;
- Translating information from the natural sciences to society and vice versa;
- Shaping the dialogue between science and society.

Knowledge

1. Knowledge of and insight into the relevant concepts and theories in the field of science communication, sociology, communication science, philosophy and science & technology studies in relation to the natural sciences;
2. Familiarity with scientific journals in the field of science communication and science & technology studies, as well as familiarity with a variety of popular-scientific media;
3. Insight into the nature and course of interpersonal and group communication processes relevant to the formal and informal dialogue between science and society;
4. Insight into relevant concepts and theories for effective communication and collaboration in relation to diverse science-society interactions;

5. Insight into the popularization of the natural sciences in various media;
6. Insight into the roles and responsibilities of museums in science communication.

Skills

1. Independently acquire, analyse and evaluate relevant information in a variety of scientific disciplines, by conducting literature study and empirical research;
2. Communicate and collaborate effectively with diverse professionals of scientific and non-scientific disciplines as well as lay citizens;
3. Design and facilitate interactive processes in relation to the science-society dialogue;
4. Translate information from various natural science disciplines into more generally accessible language and formats;
5. Produce popular-scientific media output concerning developments in the natural sciences, aimed at a variety of publics;
6. Contribute to the design of museum exhibitions from the perspective of scientific content management and science communication theory;
7. Make an intrinsic contribution to the societal discussion of developments in science and technology.

C. Final attainment levels of the major Teaching

De opleiding draagt er zorg voor dat de afgestudeerde Leraar VHO in ieder geval:

1. aantoonbaar beschikt over vakinhoudelijke kennis en vaardigheden die het wo-bachelorniveau overstijgen dan wel verdiepen. Dat wil zeggen dat de afgestudeerde Leraar VHO:
 - a. de inhoud van vak beheerst / boven de leerstofstaat;
 - b. daardoor de leerstof, voor het schooltype waarin de leraar werkzaam is, zo kan samenstellen, kiezen of bewerken dat de leerlingen die kunnenleren;
 - c. vanuit vakinhoudelijke expertise verbanden kan leggen met het dagelijks leven, met werken met wetenschappen het onderwijsbetekenisvol kan maken voordeleerlingen;
 - d. daarmee kan bijdragen aan de algemene vorming van de leerlingen.

2. aantoonbaar beschikt over vakdidactische kennis en vaardigheden. Dat wil zeggen dat de afgestudeerde Leraar VHO:
 - a. de vakinhoud weet te vertalen in leerplannen of leertrajecten en dat doet op een professionele, ontwikkelingsgerichte werkwijze;
 - b. de vakinhoud leerbaar maakt voor en afstemt op het niveau en kenmerken van de leerlingen, daarbij doelmatig gebruikmakend van (digitale) beschikbare leermiddelen;
 - c. het onderwijs kan ontwikkelen en evalueren;
 - d. het onderwijs doelmatig kan uitvoeren en het leren van leerlingen kan organiseren;
 - e. de vak inhoud/didactiek afstemt met de collega's op school en laat aansluiten bij de visie en missie van de school.

3. aantoonbaar beschikt over pedagogische kennis en vaardigheden. Dat wil zeggen dat de afgestudeerde Leraar VHO:
 - a. de ontwikkeling van leerlingen volgt in hun leren en gedrag en daarop het handelen afstemt;
 - b. bijdraagt aan de sociaal-emotionele en morele ontwikkeling van de leerlingen;
 - c. bijdraagt aan de burgerschapsvorming en de ontwikkeling van de leerling tot een zelfstandige en verantwoordelijke volwassene;
 - d. met een professionele, ontwikkelingsgerichte werkwijze en in samenwerking met collega's een veilig, ondersteunend en stimulerend leerklimaat voor leerlingen kan realiseren;
 - e. in staat is om oordelen te formuleren, rekening houdend met de sociaal- maatschappelijke en ethische verantwoordelijkheden die horen bij het beroep.

4. aantoonbaar reflecteert ten behoeve van persoonlijke en professionele ontwikkeling. Dat wil zeggen dat de afgestudeerde Leraar VHO:

- a. in staat is kritisch te reflecteren op alle aspecten die met zijn/haar persoonlijkheid, motivatie, attitudes, verwachtingen en cognities te maken hebben (die onder meer tot uiting komen in het pedagogisch handelen) en feedback hieromtrent ter harte te nemen
- b. op onderzoeksmatige wijze de (eigen) onderwijspraktijk verbetert en blijft ontwikkelen;
- c. in staat is (vak)kennis en -kunde actueel te houden;
- d. in staat is een eigen positie te bepalen ten aanzien van de missie en visie van de school/instelling en bereid is een constructieve bijdrage te leveren aan de ontwikkeling van het vak/het onderwijs in de school.

5. aantoonbaar samenwerkt en communiceert met collega's en omgeving. Dat wil zeggen dat de afgestudeerde Leraar VHO:

- a. het pedagogisch handelen kan afstemmen met collega's en met anderen die voor de ontwikkeling van de leerling verantwoordelijk zijn;
- b. de ontwikkeling van het vak/curriculum in de school kan afstemmen met collega's en met anderen die voor de ontwikkeling van de leerling verantwoordelijk zijn.

D. Learning objectives of the minor Tesla

By completing the Tesla Minor the graduate is fit to start a career in demanding environments which require abilities to utilize the disciplinary science background in research, corporate, civil society, governmental and advisory work environments.

All learning objectives fall into at least one of the following categories:

1. Information processing;
2. Teamwork;
3. Project Work;
4. Communication;
5. Self-reflection.

Further information about the minor Tesla can be found in the study guide: <http://www.teslaminor.nl>.

Appendix 2. Programme curriculum

BIOLOGICAL SCIENCES 2021/2022 - TRACK ECOLOGY AND EVOLUTION											
Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Holiday					
September	October	November	December	January	February	March	April	May	June	July	August
Obligatory track-specific starting course	Obligatory course	Elective* or free** courses					Research Project 1 (and/or Literature Review)				
Current Trends in Ecology and Evolution UVA (BEC)	Ecological Data Analysis (VU, BEC)	Environments through Time (UVA, BEC)	Global Ecology and Biodiversity (UVA, BEC)	Invasion and Conservation Biology (UVA, BEC)	Masterclasses in Ecology and Evolution (UVA, BEC)						
		Evolutionary Genomics (VU, BEC)	Tropical Ecology (VU, BEC)	Ecosystem Services and Scientific Advocacy (VU, BEC)							
Scientific Writing in English (VU, BEC)											
Track Ecology & Evolution Year 1											
BIOLOGICAL SCIENCES 2021/2022 - TRACK FRESHWATER AND MARINE BIOLOGY											
Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Holiday					
September	October	November	December	January	February	March	April	May	June	July	August
Obligatory track-specific starting course	2 out of 5 courses obligatory, others elective* or free**					Research Project 1 (and/or Literature Review)					
Advances in Aquatic Sciences (BEC)	Microbial Ecology (BEC)	Biological Oceanography (BEC)	Benthic Ecosystems (BEC)	Coral Reef Ecology (BEC)	NIOZ Marine Master Course (4EC)						
Track Freshwater and Marine Biology Year 1											
BIOLOGICAL SCIENCES 2021/2022 - TRACK GREEN LIFE SCIENCES											
Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Holiday					
September	October	November	December	January	February	March	April	May	June	July	August
Obligatory track-specific starting course	Obligatory course	Elective* or free** courses					Research Project 1 (and/or Literature Review)				
Plant Breeding and Biotechnology (BEC)	Biotic Interactions (BEC)	Developmental Biology (BEC)	Abiotic Stress (BEC)	Masterclasses in Green Life Sciences (BEC)							
Tools in Molecular Data Analysis (BEC)											
Track Green Life Sciences, Year 1											

BIOLOGICAL SCIENCES 2021/2022 - TRACK GENERAL BIOLOGY											
Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Holiday					
September	October	November	December	January	February	March	April	May	June	July	August

General Biology Year 1	Obligatory track-specific starting course	Elective* or free** courses				
	First course of other tracks (BEC)	Course (BEC)	Course (BEC)	Course (BEC)	Research Project 1 (and/or Literature Review)	
Masterclasses from other tracks						

BIOLOGICAL SCIENCES 2021/2022 - ALL TRACKS YEAR 2											
Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Holiday					
September	October	November	December	January	February	March	April	May	June	July	August

All tracks Year 2	Research variant	Elective* or free** courses					Research Project 2 (or Literature Review if not done in year 1)					
	Minor variant	Research Project 2 (30 EC)					Tesla minor**** (30 EC)					
	Major variant	Major (60 EC)****, containing courses and Research Project										
	All tracks	Professional Skills (2 courses of 1.5 EC each)** in year 1 & 2										

*For elective courses no permission is needed from Examinations Board. For the tracks E&E, F&B, and G&L, the elective courses are mentioned in the schedule.

**Free courses can be any course, given anywhere, provided permission is granted by Examinations Board in advance

***Admission to Tesla minor is after special selection procedure.

****Can be one of the following: Major Science in Society; Major Science Communication; Major Teaching.

Dark color means obligatory curriculum elements

Light color means elective curriculum elements

Hatching means that students can choose between courses, Literature Review or Research Project

Appendix 3. Programme of the site visit

Woensdag 8 december 2021		
Biologie en Biological Sciences		
9.15	9.30	Aankomst panel
9.30	10.30	Vorbereidend overleg en inzien documenten
10.30	11.30	Gesprek met inhoudelijk verantwoordelijken (3 opleidingen)
11.30	11.45	Paneloverleg
11.45	12.30	Gesprek met bachelorstudenten Biologie
12.30	13.15	Lunch
13.15	14.00	Gesprek met docenten Biologie
14.00	15.00	Rondleiding opleidingsspecifieke faciliteiten
15.00	15.15	Paneloverleg
15.15	16.00	Gesprek met masterstudenten Biological Sciences
16.00	16.45	Gesprek met docenten Biological Sciences
16.45	17.00	Paneloverleg
17.00	17.45	Gesprek toetsing bachelor Biologie en master Biological Sciences
17.45	18.00	Paneloverleg
18.00	18.30	Gesprek alumni masteropleiding Biological Sciences plus BSc Biologie

Donderdag 9 december 2021		
Psychobiologie		
8.45	9.00	Aankomst panel
9.00	9.45	Inzien documenten, voorbereiden gesprekken
9.45	10.30	Gesprek met bachelorstudenten Psychobiologie
10.30	11.15	Gesprek met docenten Psychobiologie
11.15	11.30	Paneloverleg
11.30	12.00	Gesprek toetsing Psychobiologie
12.00	12.30	Gesprek alumni Psychobiologie
12.30	13.30	Paneloverleg en lunch
13.30	14.15	Themagesprek #1
14.15	15.00	Themagesprek #2
15.00	15.30	Vorbereiden eindgesprek formeel verantwoordelijken
15.30	16.15	Eindgesprek formeel verantwoordelijken van de drie opleidingen
16.15	18.00	Opstellen voorlopige bevindingen
18.00	18.15	Mondelinge rapportage voorlopig oordeel

Appendix 4. Materials

Prior to the site visit, the panel studied 15 theses for the MSc Biological Sciences. Information on the theses is available from Academion upon request. The panel also studied other materials, which included:

- Route map MSc Biological Sciences
- Assessment plan MSc Biological Sciences
- Annual report and plans Programme and Graduate School
- Study Starter Guide FNWI
- Academic Staff
- Staff list
- Jaarverslagen Opleidings- en examencommissie 2019-2020
- Werkwijze kwaliteitsborging Examinations Board
- Uitkomst borging projecten uitvoerjaar 19-20 Examencommissie
- Information files of six courses
- Reports Advisory Boards MSc Biological Sciences
- Student's charter 2019-2020
- Teaching and Examination Regulations
- Rules and Guidelines Examination Board
- Tesla Information for students & staff