academion

BSc Biology
Radboud University

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Project code P2116

Contents

Summary

Standard 1. Intended learning outcomes

The panel is satisfied with the broad basis in biology and medical biology and the range of specializations offered by the BSc Biology of Radboud University. The intended learning outcomes match the profile and are well-chosen and sufficiently concrete. They reflect the Dublin descriptors for bachelor's programmes as well as the academic level, paying explicit attention to ethics and societal implications. The panel recommends explicitly including the focus on societal aspects and the choice for Team-Based Learning as a didactic approach as distinctive parts of the profile and communicating them clearly to prospective students.

Standard 2. Teaching-learning environment

The panel is pleased with the BSc Biology curriculum, which has recently been redesigned. It considers the curriculum coherent, feasible and sufficiently flexible, offering students plenty of opportunity to shape their own learning trajectory. The programme offers a variety of teaching methods, which were adequately adapted in the corona period. Distinctive features are the orientation towards societal and professional aspects throughout the courses in Biology in Society (BiS), attention to skills, practicals, statistics and mathematics, and writing; the internship; and Team-Based Learning (TBL). The panel advises strengthening genetics, cell biology and big data in the curriculum and making more explicit which courses touch on ethics and research integrity. It also suggests changing team composition more often in TBL courses in order to enhance the teamwork experience. Finally, it appreciates the international classroom created by the switch to English as a language of instruction, but it points out that the BSc's societal and professional orientation requires introducing Dutch-language elements into parts of the courses.

The programme offers students plenty of support, and they appreciate the open and warm atmosphere and the dedication of the teaching and supporting staff. They are also pleased with the many contact hours and the amount of written and oral feedback they receive in the courses and during corona times. The BSc portfolio has much potential in boosting study progress; the panel considers introducing specifically appointed and trained coaches to replace the current mandatory mentorship a promising new direction. It suggests also offering students training in feedback skills. The panel recommends making sure that (aspiring) students receive uniform and sufficiently detailed information about the programme, also about TBL as a didactic method. It is pleased with staff quality in the BSc and commends the programme for investing in support staff to alleviate the work pressure of the teaching staff. Further strengthening the support staff and creating permanence here would be a good development. by granting them contract extension, which the panel appreciates, also to support staff members with a large teaching load. Staff quantity is an issue that is currently under control, but the possibility of lifting the numerus fixus in the near future requires anticipating higher student influx and therefore upscaling the staff numbers and teaching facilities.

Standard 3. Student assessment

The panel considers the programme's assessment practices and the alignment of assessment with the intended learning outcomes up to standard. It understood from students and alumni that they are generally satisfied with the manner and variety of assessment. The panel recommends evaluating the use of summative peer feedback in TBL. It also advises more in-class instruction and reflection on giving peer feedback. The panel finds that the internship assessment procedure is well-designed, but it considers the influence of the second, local internship supervisor on the grade a point of attention and discussion for the programme. It also advises ensuring that written feedback on the thesis is adequately given and stored. From its interview with the examination board, the panel learnt that the board is mainly involved with *ex post* quality assurance, guaranteeing quality of assessment through routinely checking 10% of the final theses and 25% of the courses and course assessments each year. Quality advice *ex ante* is taken on by the programme committee. The panel appreciates this method, which appears to be working well. It considers the examination board to adequately fulfil its tasks.

Standard 4. Achieved learning outcomes

The panel concludes that the final theses of the BSc Biology demonstrate the level and quality that may be expected. It was pleased to see the thesis topics demonstrate the breadth of the programme. The alumni of the programme look back on it with appreciation. They usually enter master's programmes, where they benefit from the emphasis on statistics and mathematics in the RU BSc.

Score table

The panel assesses the programme as follows:

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

Fiona Schouten, secretary

Date: 24 January 2022

Introduction

Procedure

Assessment

On 23-24 September 2021, the Biology programmes of Radboud University were assessed by an independent peer review committee or 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 digital 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 Radboud University, Fiona Schouten acted as coordinator and secretary.

Preparation

Qanu composed the peer review committee 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 his role in the site visit.

The contact persons for Radboud University composed a site visit schedule in consultation with the Qanu 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 the self-evaluation reports 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

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 a 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 within Academion. Subsequently, the secretary sent the report to the panel for feedback. After processing this feedback, the secretary sent the draft report to the Radboud University Education Institute Biosciences 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 finalised the report, and the coordinator sent it to Radboud University.

Panel

The following panel members were involved in the cluster assessment:

- Prof. dr. Ton Bisseling, emeritus professor Molecular Biology at Wageningen University & Research (chair);
- Em. prof. dr. Nico van Straalen, emeritus professor 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;
- Prof. dr. Hauke Smidt, professor Microbial Ecology at Wageningen University & Research
- Dr. ir. 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;
- Dr. Eric Schouwenberg, head of department Nature and Biodiversity at Arcadis;
- Dr. Peter Korsten, researcher and lecturer in Evolutionary Biology 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 BSc Biology at Radboud University consisted of the following members:

- Prof. dr. Ton Bisseling, emeritus professor Molecular Biology at Wageningen University & Research (chair);
- Em. prof. dr. Nico van Straalen, emeritus professor of Animal Ecology at Vrije Universiteit (vice-chair);
- Prof. dr. ir. Jan Kammenga, professor of Functional Genetics at Wageningen University & Research
- Dr. ir. 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;

- Prof. dr. Hauke Smidt, professor Microbial Ecology at Wageningen University & Research (referent);
- Ishara Merhai, bachelor student Biology at University of Amsterdam (student member).

Due to personal circumstances, Prof. dr. Hauke Smidt was unable to attend the site visit and acted as referent.

Information on the programme

Name of the institution:	Radboud University
Status of the institution:	Publicly funded institution
Result institutional quality assurance assessment:	Positive

Programme name:	Biology
CROHO number:	59325
Level:	Bachelor
Orientation:	Academic
Number of credits:	180 EC
Specialisations or tracks:	-
Location:	Nijmegen
Special features:	-
Educational minor:	Applicable
Mode(s) of study:	Full-time
Language of instruction:	English
Submission date NVAO:	1 May 2022

Description of the assessment

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 BSc in Biology organized by the Faculty of Science at Radboud University is an English-language bachelor's programme that offers its students a broad basis in biology and medical biology. Students can specialise in Ecology, Microbiology, Physiology & Adaptation, Man and the Environment, Human Biology, Functional Genomics, or Neurobiology, or can follow a free learning trajectory of their own design. The bachelor's Biology programme is characterized by a clear vision on societal aspects. Through a continuous learning line Biology in Society (BiS, see standard 2), the programme aims at educating biologists who are conscious of the societal and professional impact and contexts of science. This profile has been translated into 11 intended learning outcomes (see appendix 1).

The panel is satisfied with the broad profile of the BSc programme and with its range of specializations and concludes that the intended learning outcomes (ILOs) match the profile. The programme's ILOs and profile tie in well with the Domain-specific Framework of Reference (26 June 2020). The panel considers the ILOs to be well-chosen and sufficiently concrete. They reflect the Dublin descriptors for bachelor's programmes as well as the academic level, paying explicit attention to ethics and societal implications.

According to the panel, the focus on societal aspects throughout the programme is a distinctive feature which it considers a valuable addition to the professional as well as academic orientation. Another characteristic aspect of the programme is the recent choice for Team-Based Learning (TBL) as central to its didactic approach throughout the BSc courses. The panel noticed that while these aspects are recognizable in the ILOs, they are not presented as an integral part of the programme's identity in the student guides and online information sources. This may be caused by the fact that they have been introduced only recently in a curriculum revision. The panel recommends explicitly adopting these aspects as distinctive parts of the profile and communicating them clearly to prospective students.

Considerations

The panel is satisfied with the broad basis in biology and medical biology and the range of specializations offered by the BSc Biology of Radboud University. The intended learning outcomes match the profile and are well-chosen and sufficiently concrete. They reflect the Dublin descriptors for bachelor's programmes as well as the academic level, paying explicit attention to ethics and societal implications. The panel recommends explicitly including the focus on societal aspects and the choice for Team-Based Learning as a didactic approach as distinctive parts of the profile and communicating them clearly to prospective students.

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 BSc Biology curriculum (180 EC) consists of a general phase and a specialisation phase (each 1.5 years and 90 EC). The general phase offers a broad orientation on almost all elements in the field of biology: micro-organisms, plants and animals, molecular biology, ecology and environmental biology, and human biology. During the specialisation phase, students choose one of eight learning trajectories: Ecology, Microbiology, Physiology & Adaptation, Man and the Environment, Human Biology, Functional Genomics, Neurobiology, or a free learning trajectory. Learning trajectories (30 EC) contain two to three mandatory courses and several (preferred) electives. Students can also choose courses outside the learning trajectory and/or follow a minor. In their second and third year, they are coupled to a staff member for portfolio assignments and discussion (3 EC). A mobility window is scheduled in the first semester of the third year. Students can use this semester to study abroad or at another university in the Netherlands. The BSc Biology is concluded by the BSc internship (12-15 EC). For an overview of the curriculum, see appendix 2.

The curriculum was recently redesigned to create more coherence and to make it adaptable to changes in staff and staff expertise on the one hand and societal and scientific shifts and innovations on the other. The programme merged and aligned courses to create clearer learning trajectories, added new content more in line with the New Biology approach (e.g. in the various learning trajectories and through the addition of a new big data course), introduced Team-Based Learning as a new didactic approach in the courses and strengthened attention paid to societal relevance by introducing Biology in Society (BiS) elements into the courses. At the time of the site visit, the introduction of the new curriculum had just been completed.

The panel studied the content and design of the curriculum and discussed it with programme management, teaching staff, students and alumni. It concluded that the changes have resulted in a well-balanced, broad biology programme with a clear structure. The various learning trajectories reflect the research expertise at the RU and are aligned with the research specialisations in the MScs Biology and Medical Biology. In adding New Biology and a societal orientation to the curriculum, the programme followed up the advice of the previous review (2016). The new curriculum also offers a continuous focus on academic and basic skills such as writing, presenting, statistics and mathematics.

The panel is pleased with the large number of practicals and the accompanying attention paid to experimental skills. The internship is a further positive point in the curriculum. It focuses on a (medical) biology research question which is approached by data analysis and/or lab work, and it includes presenting the research orally and writing a thesis. This allows students to gain valuable research, communication and writing skills. Students usually follow the internship at a department of Radboud University (mostly Faculty of Science) or the Radboudumc, but they can also do it with an external host. The panel wonders whether the option to go to an external host in The Netherlands or abroad for the BSc internship, is suitable for all students at this level. It recommends prudence in allowing this in the bachelor's programme, ensuring the students opting for this are up to the challenge. It noticed in some theses it looked at (see also standard 4) that this can have negative impact on the quality of the thesis itself and on the amount of feedback they receive.

The panel noticed some points for improvement. Although it considers the programme well-aligned, with each course clearly linked to learning lines and intended learning outcomes, it does find that the connection to learning outcomes 2, 9 and 11 (see appendix 1) could be made more explicit throughout the curriculum. The attention to big data (outcome 2) has clearly increased in the curriculum update, but the topic is mainly touched upon in the first year of the BSc curriculum and only involved in genomics, whereas big data play an important role in ecology, evolution as well. The panel suggests strengthening this element in years 2 and 3, possibly through creating a learning line. As for outcomes 9 and 11, the panel learnt that ethics and research integrity are frequently dealt with in the courses. However, this is not made explicit in the course guides and therefore it is not fully visible to students. The panel recommends communicating clearly when and where (and how) these learning outcomes are addressed in individual courses.

The panel is pleased with the broad nature of the BSc, which introduces students to a wide variety of areas in the field of life sciences before specialising. It noticed that currently, the amount of attention paid to genetics is relatively limited and at a too late stage in the curriculum. The same is true for cell biology, but this is bound to improve now that a new expert has been hired. According to the panel, genetics is an important element in any Biology BSc, and the programme should look into ways to strengthen this. The panel also found that while many (sub)disciplines are taught, the programme tends to offer them as separate elements. The panel sees opportunities for interdisciplinary connections within the programme.

As mentioned, the programme has introduced Biology in Society in many of the courses, ensuring that they offer an element focusing on either 'Science in Society', 'Science, Management and Innovation', 'Science in Education' or 'Science and Research'. Biology in Society (BiS) is still being developed and the programme is working on expanding it further throughout the courses with the help of BSc coordinators. The panel discussed BiS with students and learnt that they are enthusiastic about these elements. The panel applauds this distinguishing feature of the BSc.

Teaching methods and corona impact
The teaching methods within the programme are varied, from presentations and peer feedback to internship and practicals. With the new curriculum, Team-Based Learning (TBL) was introduced as a didactic approach. TBL was first implemented as a pilot in the course Man and Environment and later in three more courses (Genomics and Big Data, Statistics and Medical Embryology). An educational innovator was hired in 2019 to coordinate TBL. It is now being developed as a continuous teaching method throughout the BSc programme. TBL aims for increased participation and activation of the students, who work together in groups and study a theme through linking theory to practice and application. The students themselves determine the learning process as much as possible. Care is taken to ensure sufficient quality of learning is reached. Students need to be assessed both individually and as a group on their preparation before working together in class on assignments, and they are provided with a variety of study materials. The teaching staff act as coaches and ensure all students achieve the course's learning objectives.

The panel considers TBL a valuable addition to the curriculum. It learnt from students that even though some do not appreciate the method, the majority is pleased with this didactic approach and feels it is conducive to an active attitude. The students did have some reservations concerning the assessment of TBL, which will be discussed in standard 3. TBL allows students to acquire cooperative skills, and in doing so clearly matches learning outcome 8 (see appendix 1). The panel appreciates this. It learnt that the programme carefully composes teams of 6-8 students based on background, interests, gender and personality traits, and that it retains these groups through multiple courses so that the groups end up developing a collaborative style which allows them to tackle later TBL courses with more ease. The panel understands that this can be seen as an advantage, but it points out that this working method allows students to stick to the roles they have adopted from the start. It would like to suggest changing team composition more often in order to enhance the teamwork experience and get students out of their comfort zones to experiment with different roles.

The corona pandemic clearly impacted the courses and the teaching methods. During the lockdowns, the programme managed to facilitate essential lab skills teaching on-site for most practical courses; all other experiments were converted to digital lab modules, mostly in an H5P digital environment. Lectures and work groups were taught via Zoom or Brightspace, and often recorded. The programme was run without needing to alter the course objectives. The panel applauds the programme for achieving this. It learnt that the prominence of digital teaching methods has contributed lastingly to teaching and learning quality in the programme. As an opportunity for future development, the panel suggests considering retaining elements that work well, such as recorded lectures. It also suggests using this impulse to further enrich teaching in the programme with additional innovative methods, such as flipping the classroom.

During COVID-19, continuation of internships turned out to be the most challenging. Students had difficulty finding internship positions as the occupancy of labs was restricted by the COVID-19 regulations. For BSc internships, the student advisor and the BSc Biology programme coordinators actively scouted for internship positions, and they coupled students to supervisors. In addition, many internships were converted to (mostly) data-analysis projects that could be done from home. The panel considers the internship an important element of the programme and is pleased that such solutions were found.

Student guidance and feasibility
The BSc programme offers students much room to make their own choices and design their own learning paths. One element (3 EC) of the programme supporting them in doing so is the Bachelor Portfolio Biosciences. The portfolio focuses on academic development, study progress and skills and competences. Every year, students get assignments which they discuss during portfolio meetings; these are usually organised within the TBL groups. In the first year (B1) these meetings are held with one of the study advisors. At the end of the second (B2) and third (B3) year students meet with a lecturer from one of the research institutes associated with Biosciences (DCN-FNWI, IWWR (now RIBES), RIMLS-FNWI). During their second year, students are also linked to one of these lecturers based on their chosen learning trajectory. That lecturer functions as their portfolio mentor during both B2 and B3.

The panel is positive about the design of the portfolio, which provides guidance and reflection and ties in well with BiS and TBL. However, it learnt from the documentation and from conversations with programme staff, students and alumni that the portfolio does not entirely live up to its potential. The consensus is that the successful use of the portfolio is strongly dependent on the time and effort that the portfolio mentor can and will spend on it. Since these mentors did not volunteer for the job, but get assigned to students by the management, some are less motivated or less able to invest in the portfolio in the light of their many other duties (see 'Teaching staff'). In order to address this issue, BSc and MSc portfolio coordinators have been appointed to improve the use of the portfolio. In a first pilot, the mentors have been replaced by coaches: staff members that have been selected and trained specifically. This is already experienced as a great improvement, and the panel supports adapting the portfolio accordingly.

BSc students are supported by teaching staff, programme and internship coordinators, and study advisors, and by the mentor in B2 and B3. There is a lively student association, BeeVee, which organises study as well as informal events, often in cooperation with the programme. The students and alumni interviewed by the panel praised the good atmosphere among staff and students, the dedication of the teaching and supporting staff, and the help they got when struggling with personal problems or choices. They were also pleased with the many contact hours and the amount of written and oral feedback they received throughout the programme. During the lockdowns, study advisors experimented with online coaching sessions, which turned out to make them even more approachable for students and which the panel suggests could be continued further. Students were also offered mental support and aid, and where possible, informal meetings at distance were organised. All in all, the students of the programme feel well guided and supported. They consider the programme feasible.

Students receive their information on various places, most notably through the online course guide and Brightspace. The panel found this documentation accessible and well-designed, but it noticed that both the course titles and the course contents are often formulated in very general terms. Course descriptions frequently don't include learning objectives or references to the intended learning outcomes, even though these have been carefully formulated and aligned in the curriculum adaptation. The panel also found some discrepancies between various information sources. Finally, the panel was surprised to see that TBL, a prominent didactic method, is not mentioned as a feature in any of the information sources or on the general website (see also standard 1). Students entering the programme are therefore unaware of this approach. The panel finds that more expectation management is necessary here to stimulate enthusiasm among students and to avoid disappointment among the minority of students who dislike this type of approach. In short, the

panel advises the programme to make improvements here and provide clear, uniform and sufficiently detailed information about the programme to (aspiring) students.

Language of instruction
The BSc switched to English with the new curriculum, in line with university- and faculty-wide policy. The panel discussed this change with students and alumni. It learnt that on the whole, they are satisfied with it, especially since it allows an influx of international students. According to students, their perspectives and presence in class are enriching. Dutch students struggling with the language are offered support, for instance through the Radboud In'to Languages expertise centre. Teaching staff who struggle or who are evaluated negatively on this aspect are offered similar options.

The panel discussed the switch to English at length with representatives of the programme. It sees the advantages of English and the ensuing international classroom and understands that this opens possibilities for international research and education talent to participate in teaching. Nevertheless, it finds that the choice of language doesn't entirely match the societal and professional orientation that characterises the new curriculum. Thanks to BiS and similar elements, students are explicitly prepared for non-research positions, for instance as policy makers. In such positions, Dutch-language communication skills are still required. The panel recommends introducing Dutch-language elements into parts of the courses to address this specific issue or find other solutions to bridge the possible mismatch between the program's societal orientation and the need for Dutch fluency in many societal positions.

Teaching staff and facilities
The panel finds that the teaching staff in the programme is clearly equipped to teach the programme. Staff members are usually actively involved in research. They are also didactically skilled: teaching staff is required to have a basic teaching qualification and some hold a senior qualification. There is a well-functioning system in place to help staff members further professionalise (Radboud Teaching and Learning Centre).

The quantity of staff is mentioned as a point of attention in the documentation the panel received. In discussing this matter with all stakeholders, including students and alumni, the panel concluded that this is indeed the case. Staff members experience a high workload. This situation is currently under control, since the programme has a numerus fixus in place. However, a further increase of students upon alleviating the numerus fixus could stretch the programme beyond its current maximum capacity (200).

The panel is pleased to see that the programme has been able to use temporary Corona funding to expand the educational support significantly. It learnt from teachers that the various supporting staff members (Edusupport, TIPScience ICT support, Radboud Teaching and Learning Centre, student advisors or (BSc) internship coordinators) are highly appreciated. With corona funds, non-academic staff members (teaching assistants) have been hired. They allow the teaching staff to focus on their core tasks by unburdening them from administrative tasks and implementing and coordinating overarching elements such as BiS. They also organise inspiration and coordination sessions. Strengthening the support staff and creating permanence here would be a good development, according to the panel. The programme aims to include more PhD students in BSc teaching by offering them an extension for teaching, and supports staff members with a large teaching load by allowing them a PhD student (paid by RU) to support them both in education and in research. It applauds this practice and urges its continuation as well as that of the positions of non-academic teaching assistants.

Right now, Radboud University is considering to abandon the numerus fixus. It is likely that this will lead to an increase in student numbers, and the programme, faculty, and university should anticipate this. The panel points out that the personal contact, the intensive teaching of skills and practicals, and the in-class discussion and feedback sessions are valuable and valued elements that should be maintained. Any increase

in student numbers should therefore be matched with an increase in teaching and support staff. The same goes for teaching facilities, which the panel considers adequate for current student numbers, but which may not suffice when these numbers increase.

Considerations

The panel is pleased with the BSc Biology curriculum, which has recently been redesigned. It considers the curriculum coherent, feasible and sufficiently flexible, offering students plenty of opportunity to shape their own learning trajectory. The programme offers a variety of teaching methods, which were adequately adapted in the corona period. Distinctive features are the orientation towards societal and professional aspects throughout the courses in Biology in Society (BiS), attention to skills, practicals, statistics and mathematics, and writing; the internship; and Team-Based Learning (TBL). The panel advises strengthening genetics, cell biology and big data in the curriculum and making more explicit which courses touch on ethics and research integrity. It also suggests changing team composition more often in TBL courses in order to enhance the teamwork experience. Finally, it appreciates the international classroom created by the switch to English as a language of instruction, but it points out that the BSc's societal and professional orientation requires introducing Dutch-language elements into parts of the courses.

The programme offers students plenty of support, and they appreciate the open and warm atmosphere and the dedication of the teaching and supporting staff. They are also pleased with the many contact hours and the amount of written and oral feedback they receive in the courses and during corona times. The BSc portfolio has much potential in boosting study progress; the panel considers introducing specifically appointed and trained coaches to replace the current mandatory mentorship a promising new direction. It suggests also offering students training in feedback skills. The panel recommends making sure that (aspiring) students receive uniform and sufficiently detailed information about the programme, also about TBL as a didactic method. It is pleased with staff quality in the BSc and commends the programme for investing in support staff to alleviate the work pressure of the teaching staff. Further strengthening the support staff and creating permanence here would be a good development by granting them contract extension, which the panel appreciates, also to support staff members with a large teaching load. Staff quantity is an issue that is currently under control, but the possibility of lifting the numerus fixus in the near future requires anticipating higher student influx and therefore upscaling the staff numbers and teaching facilities.

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

Student assessment in the BSc Biology takes place according to faculty and university policy and regulations. This includes the use of rubrics and test matrices, and of formative as well as summative assessment. Students are offered clear and timely information on the tests they are taking. Assessment is varied and matches the learning outcomes of the courses. As a part of the curriculum redesign, assessment was streamlined to align with the intended learning outcomes. The programme makes use of the online assessment environment Cirrus, which is particularly useful for assessment for larger groups of students. During the corona period, this digital approach turned out to be of extra benefit. It can be used for multiple choice as well as essay questions and allows easy and transparent access to an analysis of the results after the test. Lecturers get support from the faculty-wide digital assessment team for working with Cirrus. The panel considers the programme's assessment practices up to standard. It understood from students and

alumni that they are generally satisfied with the manner and variety of assessment, including the necessary adaptations made during the lockdowns.

The panel looked into the assessment of Team-Based Learning and discussed it with staff and students. It learnt that TBL assessment partly consists of written exams, but that it is also partly done through peer assessment, in line with the TBL concept. Students assess their team members anonymously through a short questionnaire and have a number of points to divide among their team members, thus creating a ranking. This score determines part of the final grade, depending on the course. Students mentioned to the panel that they struggled with the peer feedback component. They felt uncomfortable giving and receiving summative assessment through peer feedback, particularly since the ranking system through the division of points did not allow them to award equal scores to different group members. The panel recommends evaluating the use of summative peer feedback in TBL and adapting this approach to avoid students ranking each other. It also advises more in-class instruction and reflection on giving peer feedback.

The assessment of the 3 EC BSc portfolio is done by the student's portfolio mentor. Students don't receive a grade, but must have completed it in order to receive the credits and be allowed to graduate. As mentioned in standard 2, the role of the mentor is crucial in producing the added value for which the portfolio is intended. The panel therefore expects that the assessment of the portfolio will also benefit from a system of selected and trained coaches rather than appointed mentors (see Standard 2).

Final projects
At the end of the BSc, students embark on their final projects, consisting of an internship (55% of the final grade), thesis (35%) and oral presentation (10%). At the start of the internship, the student submits an internship plan, which is evaluated (go/no go) by the BSc internship coordinator. Its size and the appropriate number of credits (12-15 EC) are also determined then in dialogue between coordinator and student. The student is supervised during the internship by a daily supervisor/first examiner. In cases where the daily supervisor is not a RU-approved examiner, an extra examiner has to be added. Midway through the internship, students receive formative feedback during a midterm review with the first examiner; the final assessment by the first examiner is done according to the same procedure. Students are also required to present their findings in at least one oral presentation, usually during a work-discussion at the department where the research was done, which is assessed by the first examiner. If the presentation is graded below 5.0, a second presentation is compulsory. For the thesis, a second RU-approved examiner is involved in the assessment, who fills out a separate assessment form. The thesis grade is determined in consultation between the two readers. If the grade of the first and second evaluator deviates more than one point and they cannot reach a consensus, the examination board appoints a third examiner.

The panel finds that the internship assessment procedure is well-designed. It looked at a selection of theses and the accompanying assessment forms and noticed that around 15% of students do their final projects outside the RU. In many of these cases, the panel found that while the RU examiner is responsible, the external supervisor often has a strong or even decisive voice in determining the assessment of the internship. This can lead to higher final grades than warranted by the quality of the work, as was the case in some theses the panel saw, and is therefore a point of attention and discussion for the programme. The panel also found that the assessment forms often lack written feedback. It learnt that this is in many cases due to a shortcoming of the digital platform used, which does not permit examiners to send the assessment forms to their students. Examiners therefore choose other, informal ways to give feedback to students and don't always dedicate sufficient time and attention to the form that is stored. The panel advises ensuring written feedback is adequately stored and shared with students. This contributes to a professional and transparent assessment and makes sure all students will actually have that feedback. The panel learnt that the examination board has raised this issue with the programme management, and supports the board in this.

Examination board
The examination board consists of seven members and a secretary, who fulfil their legal task of guaranteeing quality of assessment through checking 10% of the final theses and 25% of the courses and course assessments each year, and advising programme management and examiners on the outcomes. In order to achieve this, the board has divided tasks: there is a daily board as well as an assessment committee, which looks at the courses. The board was also involved when assessment in the programme was adapted to the corona situation. The panel learnt from its interview with the board that it sees itself as primarily responsible for *ex post* quality assurance and control. Its role in advising on such developments as the BSc curriculum renewal was therefore limited. The panel also learnt that the programme committee takes on much of the *ex ante* quality advice, checking in with the examination board when necessary. The panel learnt that all involved are satisfied with this approach, which appears to be working well. It finds that the examination board adequately fulfils its tasks.

Considerations
The panel considers the programme's assessment practices and the alignment of assessment with the intended learning outcomes up to standard. It understood from students and alumni that they are generally satisfied with the manner and variety of assessment. The panel recommends evaluating the use of summative peer feedback in TBL. It also advises more in-class instruction and reflection on giving peer feedback. The panel finds that the internship assessment procedure is well-designed, but it considers the influence of the second, local internship supervisor on the grade a point of attention and discussion for the programme. It also advises ensuring that written feedback on the thesis is adequately given and stored. From its interview with the examination board, the panel learnt that the board is mainly involved with *ex post* quality assurance, guaranteeing quality of assessment through routinely checking 10% of the final theses and 25% of the courses and course assessments each year. Quality advice *ex ante* is taken on by the programme committee. The panel appreciates this method, which appears to be working well. It considers the examination board to adequately fulfil its tasks.

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 looked at a selection of 15 final theses of the BSc programme representing the various fields of expertise (since the theses largely predated the completion of the curriculum change, it was not possible to select by specialization). It concluded that all of these demonstrate the level and quality that may be expected from a BSc thesis in Biology. The panel was pleased to see that the theses cover a wide range of topics, demonstrating the full breadth of the programme.

Alumni of the programme usually continue in master's programmes at the RU or elsewhere. The panel met some of the alumni and learnt that they look back on the programme with appreciation. Especially the attention paid to statistics, mathematics and similar skills stood out to them as valuable compared to the knowledge and skills of graduates from other BSc Biology programmes.

Considerations
The panel concludes that the final theses of the BSc Biology demonstrate the level and quality that may be expected. It was pleased to see the thesis topics demonstrate the breadth of the programme. The alumni of

the programme look back on it with appreciation. They usually enter master's programmes, where they benefit from the emphasis on statistics and mathematics in the RU BSc.

Conclusion

The panel concludes that the programme meets standard 4.

General conclusion

The panel's assessment of the BSc Biology is positive.

Development points

1. Include the BSc's focus on societal aspects and the choice for Team-Based Learning as a didactic approach explicitly as distinctive parts of the profile, and communicate them clearly to prospective and current students.
2. Increase attention paid to genetics and big data throughout the curriculum, and make explicit where ethics and research integrity are dealt with.
3. Enhance Team-Based Learning by change group composition more frequently and by re-evaluating summative peer assessment.
4. Adapt the BSc portfolio according to the current pilot setup, introducing trained coaches to replace appointed members.
5. Introduce Dutch-language elements into parts of the courses in light of the programme's societal and professional orientation.
6. Invest in (permanent) support staff to reduce work pressure. Anticipate the possible lift of the numerus fixus and the need for new staff and facilities this would create.
7. Re-evaluate the influence of external internship supervisors on the final grade in day-to-day practice, also paying attention to internships done abroad.
8. Ensure that written feedback on the thesis is archived and that all students are getting it.

Appendix 1. Intended learning outcomes

A Bachelor in Biology:

1: is able to analyse current biological concepts critically, based on a broad knowledge and understanding of the functioning and the behaviour of living organisms (plants, animals including humans, microorganisms and viruses) with reference to the relationships between organisms, the levels of organisation within nature (molecule, cell, organ, organism, population and ecosystem), biological processes (evolution, development, adaptation, disease) and the biotic and abiotic environment.

2: understands the complexity of (medical) biology: interconnects the different subdisciplines in (medical) biology and applies knowledge about mathematics, physics, chemistry and computer science correctly to (medical) biological research. The bachelor is knowledgeable about quantitative and big data approaches and applies this knowledge in a multidisciplinary research environment to process large and diverse data sets in order to achieve a better understanding of (medical) biological systems.

3: interprets how (medical) biological knowledge and understanding is established and understands how theories can be tested experimentally and how knowledge obtained from experiments can lead to new insights that contribute to the (medical) biological knowledge base.

4: uses both theoretical and practical knowledge in order to formulate hypotheses about (medical) biological problems, develops experiments and executes experiments as a means of testing these hypotheses, oversees and interprets the results and, on the basis of these, draws conclusions and reports on the results of the research.

5: applies a variety of basic techniques that are relevant to (medical) biological research and successfully adopts new experimental techniques.

6: gathers and understands scientific literature, distinguishes between major and minor issues in an article and views the knowledge from the literature in the context of the knowledge that has already been acquired.

7: reports on and discusses own research and literature studies in a clear manner, both verbally and in writing in accordance with the general format of a scientific journal or in another appropriate format to a broad scientific of non-scientific audience.

8: collaborates as a member of a (scientific) team and executes individual tasks within this team and competently shares the results that have been obtained.

9: reflects on and forms an opinion about the ethical and societal implications of (medical) biological research and argues this opinion in both its societal and scientific contexts.

10: reflects on own actions, ambitions, skills and perspectives and thus shapes the own career based on informed choices that were made in the bachelor minor programme and/or on subsequent choices for a master's programme, including its specialisations, or in continuation of work in the professional field.

11: behaves in accordance with Scientific Integrity Regulations, as specified in the relevant university regulations.

Appendix 2. Programme curriculum

Year 1

1st Semester, 1st Quarter

- Introduction to the Bachelor Programme (NWI-BP001B, 0 EC)
- Evolution and Development of Plants (NWI-BP003B, 6 EC) (PA)
- Statistics 1 (NWI-BP012C, 3 EC) (all LT)
- Animal Evolution and Adaptation (NWI-BP004C, 6 EC) (PA, HB, Ne)

1st Semester, 2nd Quarter

- Research Skills - Bachelor (NWI-BP001C 0 EC)
- Cellular biochemistry (NWI-BP007C, 6 EC) (Pa, Mb, FG, HB, Ne)
- Molecular Biology and Recombinant DNA (NWI-BP010C, 3 EC) (PA, Mb, FG, Ne)
- Microbiology (NWI-BP033, 6 EC) (Mb)

2nd Semester, 3rd Quarter

- Ecology (NWI-BP030, 6 EC) (Ec, ME, PA, Mb)
- Histology (NWI-BP006B, 3 EC) (PA)
- Genomics and Big Data (NWI-BP031, 6 EC) (Ec, ME, PA, Mb, FG, Ne)

2nd Semester, 4th Quarter

- Biodiversity (NWI-BP027B, 6 EC) (Ec, ME, PA)
- Mathematics for Biologists (NWI-BP024C, 3 EC) (all LT)
- Human Biology (NWI-BP032, 6 EC) (HB, Ne)

Year 2

1st Semester, 1st Quarter

Mo-Tue
• NWI-BB090 Microbial Metabolism (6 EC) (Mb)
Wed
• NWI-BB005C Animal Physiology (3 EC) (PA, HB)
Thu-Fri
• NWI-BB085C Brain and Behaviour (6 EC) (HB, Ne)

1st Semester , 2nd Quarter

Mon-Tue
• NWI-BB069B Plant Physiology (6 EC) (PA)
Wed
• NWI-FCEM02B Writing about Science (3 EC) two options EN and NL (all LT)
Thu-Fri
• NWI-BB091 Genetics (3 EC) (Ec, PA) • NWI-BB071B Man and Environment (3 EC) (ME)

In the second semester you will be able to choose from a wide range of courses. The 6 ECTS courses are always scheduled on a Monday-Tuesday or on a Thursday-Friday. For each of these time slots you are expected to choose one course each quarter. Seven learning trajectories are defined. For each course, the learning trajectories in which it fits are listed in the table below.

On Wednesdays the 3 ECTS courses are offered. Please note that these courses are compulsory for your Bachelor's degree.

2nd Semester, 3rd Quarter

Mo-Tue (6 EC courses)
• NWI-MB023C Man and Nature: Present, Past and Future (**ME**) • NWI-BB092 Neural Basis of Cognition and Perception (**Ne**) • NWI-BB043B Plant Genome Analysis (**PA**, FG) • NWI-BB089 Quantitative Bioimaging (Ne, HB, Mb, PA, FG)
Wed (3 EC course, compulsory)
• **NWI-BB093 Statistics 2**
Thur-Fri (6 EC courses)
• NWI-BB024B Physiology of Microorganisms (**Mb**) • NWI-BB019B Immunology (**HB**, FG) • NWI-BB018C Ecophysiology of Plants (**PA, Ec,** ME)

2nd Semester, 4th Quarter

Mo-Tue (6 EC courses)

- NWI-BB094 Neurons and Synapses (**Ne**)
- NWI-BB060B Animal Ecology (**EC,** PA, ME)
- NWI-BB017C Advanced Molecular Biology (**FG**, HB, Mb, PA)

Wed (3 EC course, compulsory)

- **NWI-FFIL100 Philosophy and Ethics of Science**

Thur-Fri (6 EC courses)

- NWI-BB047C Medical Embryology (Ne, **HB**, PA, FG)
- NWI-BB048B Endocrinology (**PA**, HB)
- NWI-BB087 Population and Evolutionary Biology (Ec, Mb, PA, FG)
- NWI-MB021B Geographic Information Systems (**ME**, Mb, Ec)

Year 3

1st Semester, 1st Quarter

Mon-Tue (6 EC courses)

- NWI-BB086 Genomics for Health and Environment * (12 EC) (PA, Mb, FG, HB)
- NWI-BB080C Neural Basis of Motor Control (Ne)
- NWI-BB083B Ecological Theory and Data Analysis (Ec, ME, Mb, FG)
- NWI-MOL107 RNA Structure and Function (FG)

Wed (3 EC courses)

- NWI-BB011B Biology and Society
- NWI-BB095 Introduction to R Programming in Biology (Ec, ME, Mb, FG, HB, Ne)
- NWI-FNWI008 Onderwijzen in Betawetenschappen (NL)

Thur-Fri (6 EC courses)

- NWI-BB086 Genomics for Health and Environment * (12 EC) (PA, Mb, FG, HB)
- NWI-BB022B Systems Ecology (Ec, PA, Mb)
- NWI-MOL101 Essentials of Organic Chemistry (Mb)
- NWI-MOL104 Medical Biotechnology (FG, HB)
- MED-MIN16 Translational Neuroscience ** (12 EC) (Ne)

1st Semester, 2nd Quarter

Mo-Tue (6 EC courses)

- NWI-MB024C Human and Ecological Risk Assessment (Ec, ME, Mb)
- NWI-BB084B Molecular Principles of Development (PA, FG, HB,Ne)
- NWI-BB039C Neurodevelopment (Ne)
- NWI-MOL053 Pharmacochemistry

Wed (3 EC courses)

- NWI-FC0042B Debating Science in Society
- NWI-GCSE002 Energy and Sustainability (3 EC)
- NWI-BB028B History of Biology
- NWI-BB079C Water, Health, and Development (ME)
- NWI-GCSE001 Climate Change: Science & Policy (ME)

Thur-Fri (6 EC courses)

- NWI-BB021B Neurobiophysics (Ne)
- NWI-BB088 Biological Invasions (Ec, ME)
- NWI-BB097 Infectious Diseases (Mb, HB)
- MED-MIN16 Translational Neuroscience ** (12 EC) (Ne)

* Note that this is a 12 EC course in the first quarter, filling both the Mon-Tue and Thu-Fri time slots.
** Note that this is a 12 EC course running over the entire first semester. A selection procedure applies. For details, check the course description.

2nd Semester, 3rd Quarter

Mon-Tue (6 EC courses)

- NWI-BB027C Applied and Environmental Microbiology (**Mb,** Ec)
- NWI-BB036B Applied Ecology (**Ec,** ME, Mb, FG)
- NWI-BB025B Principles and Practice of Human Pathology (**HB)**
- NWI-BB032C Biotechnology of Plants **(PA)**

Wed (3 EC courses)

- NWI-BB099 Biology Essay **Compulsory (Ec, ME, PA, Mb, FG, HB, Ne)**

Thur-Fri (6 EC courses)

- NWI-BB081B Cognitive Neuroimaging (Ne)
- NWI-MOL055 Molecular Basis of Diseases (HB)
- NWI-MOL054 Toxicology (ME,HB)
- NWI-BB020C Animal Adaptation Physiology (**PA,** Ec)
- NWI-BB064B Functional Genomics (**FG,** PA, Mb, HB)

2nd Semester, 4th Quarter

NWI-BB-STAGE Bachelor internship Biology (12 EC) **(Ec, ME, PA, Mb, FG, HB, Ne)**
NWI-BB076B Bachelor portfolio (sign off) (3 EC) (**Ec, ME, PA, Mb, FG, HB, Ne)**

Appendix 3. Programme of the site visit

Day 1 (Thu 23 September 2021)		
8.45	9.00	Arrival panel & welcome
9.00	10.00	Panel discussion
10.00	11.00	Meeting with Board Education Institute Biosciences
11.00	11.15	Panel discussion
11.15	12.00	Meeting with 6 students of the BSc Biology, incl. 2 alumni
12.00	12.45	Lunch
12.45	13.30	Meeting with lecturers of the BSc Biology
13.30	14.00	Panel discussion
14.00	14.45	Meeting with students of the MSc Biology
14.45	15.30	Meeting with lecturers of the MSc Biology
15.30	16.00	Panel discussion
16.00	16.45	Meeting with students of the MSc Medical Biology
16.45	17.30	Meeting with lecturers of the MSc Medical Biology, incl. SMI & SiS
17.30	18.00	Panel discussion

Day 2 (Fri 24 September 2021)		
8.45	9.00	Arrival panel
9.00	9.30	Panel discussion
9.30	10.15	Meeting with alumni of the MSc Biology and MSc Medical Biology
10.15	10.45	Meeting with the examination board
10.45	11.15	Panel discussion
11.15	12.00	Discussion about assessment
12.00	12.45	Lunch
12.45	13.45	Tour of facilities
13.45	14.15	Meeting with our education support
14.15	15.00	Voorbereiden eindgesprek formeel verantwoordelijken
15.00	15.45	Final meeting with those formally responsible
15.45	17.15	Panel discussion (“Opstellen voorlopige bevindingen”)
17.15	17.30	Public presentation of concept evaluation
17.30		Drinks

Appendix 4. Materials

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

General	
Overview & reading guide	A. Overview documents (this file) B. Reading guide documents
SWOT	A. SWOT BSc Biology B. SWOT MSc Biology C. SWOT MSc Medical Biology
Student chapter	A. BSc Biology mp4 B. MSc Biology mp4 C. MSc Medical Biology mp4 D. Highlights
Regulations	
EER	
Rules and Regulations	
Annual Reports & Minutes	A. Annual reports Education Institute Biosciences (2018-2019 & 2019-2020) B. Minutes Education Institute Biosciences Board (2019-2020) C. Minutes Programme Committee (2019-2020) D. Minutes Examination Board (2019-2020)
Programmes	
Course guide: including programme profile and goals and competences	A. Course guide B. Courses versus Goals BSc and MSc programme (VM) C. Programme overviews
Biology in Society (BiS), Skills & Portfolio (incl. student guidance)	A, B. BSc BiS & Skills C. BSc & MSc Portfolio
Reference framework	9A. BSc Biology 9B. MSc Biology
BSc Biology Programme revision	A. Report of the "preadviescommissie" (2014) B. Report of the "curriculumherzieningscommissie" (2016)
English-taught programmes	Beleidskader voertaal opleidingen University teaching qualification
Numerus Fixus	
Brightspace	Access to 11 courses
Professional field report	

Labour market research alumni	15A. NIBI arbeidsmarktonderzoek Masters per mastercluster 15B. NIBI arbeidsmarktonderzoek Masters RU 15C. NIBI arbeidsmarktonderzoek Masters per werksector
COVID-19 impact (incl. exams)	16A. Impact & adjustments 16B. COVID-19 FNWI report 16C. COVID-19 adjustments within Biology programmes
Facts, figures & procedures	
Facts	17A. Enrollment numbers BSc & MSc
	17B1. BSc BSA 17B2. BSc success rate 17B3. BSc to MSc numbers
	17C. Msc Biology and Msc Medical Biology succes rate
	17D. Staff & Examiners (2020)
Course dossiers	18A BSc Biology course 1,2,3 18B MSc Biology course 1,2,3 18C MSc Medical Biology course 1,2,3 18D MSc SMI course 1 and SiS course 2
A. List of final projects (internships) for students in 2019-2020 for the BSc and MSc B. Selected final projects per panel member	
BSc Internship	procedure
	organising
	departments
	internship plan & assessment forms
MSc Biology Research Internships	
MSc Medical Biology Research Internships	
MSc Biology & MSc Medical Biology Review Article	Information (course guides) Example Review articles (VM): 2 MSc Biology (23A&B) 2 MSc Medical Biology (23C&D)
MSc Biology & MSc Medical Biology Research Proposal	Information (course guides) Example Research Proposals (VM): 2 MSc Biology (24A&B) 2 MSc Medical Biology (24C&D)