BIOMEDICAL SCIENCES

FACULTY OF HEALTH, MEDICINE AND LIFE SCIENCES

MAASTRICHT UNIVERSITY/TRANSNATIONALE UNIVERSITEIT LIMBURG

QANU
Catharijnesingel 56
PO Box 8035
3503 RA Utrecht
The Netherlands

Phone: +31 (0) 30 230 3100
E-mail: support@qanu.nl
Internet: www.qanu.nl

Project number: Q0623

CONTENTS

This report was finalized on 2 April 2018

REPORT ON THE BACHELOR'S PROGRAMME BIOMEDICAL SCIENCES AND THE MASTER'S PROGRAMME BIOMEDICAL SCIENCES OF MAASTRICHT UNIVERSITY/TRANSNATIONALE UNIVERSITEIT LIMBURG

This report takes the NVAO's Assessment Framework for Limited Programme Assessments as a starting point (September 2016).

ADMINISTRATIVE DATA REGARDING THE PROGRAMMES

Bachelor's programme Biomedical Sciences

Name of the programme:	Biomedical Sciences
CROHO number:	56990
Level of the programme:	bachelor's
Orientation of the programme:	academic
Number of credits:	180 EC
Specializations or tracks:	-
Location(s):	Maastricht
Mode(s) of study:	full time
Language of instruction:	English
Expiration of accreditation:	31/12/2019

Master's programme Biomedical Sciences

Name of the programme:	Biomedical Sciences
CROHO number:	66990
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	Genetics & Genomics Inflammation & Pathophysiology Nutrition, Physical Activity & Metabolism Regenerative Medicine Imaging from Molecule to Men
Location(s):	Maastricht
Mode(s) of study:	full time
Language of instruction:	English
Expiration of accreditation:	24/02/2020

The visit of the assessment panel Biomedical Sciences to the Faculty of Health, Medicine and Life Sciences of Maastricht University took place on 29-30 January 2018.

ADMINISTRATIVE DATA REGARDING THE INSTITUTION

Name of the institution:	Maastricht University/transnationale Universiteit Limburg
Status of the institution:	publicly funded institution
Result institutional quality assurance assessment:	positive

COMPOSITION OF THE ASSESSMENT PANEL

The NVAO has approved the composition of the panel on 27 July 2017. The panel that assessed the bachelor's programme Biomedical Sciences and the master's programme Biomedical Sciences consisted of:

- Prof. dr. John Creemers (chair), professor of Biomedical Science at KU Leuven, Belgium;
- Prof. dr. Dirk Snyders, professor of Biomedical Sciences at the University of Antwerp, Belgium.
- Dr. Mieke Latijnhouwers, assessment advisor at the Radboud University Medical Hospital, Nijmegen
- Prof. dr. Rudi D'Hooge, professor at the Faculty of Psychology & Educational Sciences, KU Leuven, Belgium;
- Dr. Nellie Harms, (former) director of education at the Faculty of Earth and Life Sciences, Vrije Universiteit, Amsterdam
- Boas van der Putten MSc (student-member), PhD candidate at the Amsterdam Institute for Global Health and Development (AIGHD);

The panel was supported by dr. M.J.V. (Meg) Van Bogaert, who acted as secretary and dr. A. (Alexandra) Paffen, who acted as project manager.

Appendix 1 contains the curricula vitae of the panel members.

WORKING METHOD OF THE ASSESSMENT PANEL

Preparation
The project manager of QANU met with staff members of the bachelor and master Biomedical Sciences programmes on April 4, 2017 for a preparatory meeting. QANU received the self-assessment report of the master's programme Biomedical Sciences in December 2017 and made it available on a secure online website. The panel members read the self-assessment and prepared questions, comments and remarks prior to the site visit. The secretary collected these questions in a document and arranged them according to panel conversation and subject.

In addition, all panel members read recent theses from the programmes. In consultation with the chair, fifteen theses were selected from the academic year 2016-2017, covering the full range of marks given and all specializations. The panel members also received the grades and the assessment forms filled out by the examiners and supervisors. An overview of all documents and theses reviewed by the panel is included in Appendix 6.

The project manager drafted a programme for the site visit. This was discussed with the chair of the panel, the policy officer and the programme director. As requested by QANU, the programme director carefully selected discussion partners. A schedule of the programme for the site visit with all partners is included in Appendix 5.

Site visit
The site visit took place on 29 and 30 January 2018 at Maastricht University. In a preparatory meeting the panel members discussed their findings based on the self-assessment and on the theses and formulated the questions and issues to be raised in the interviews with representatives of the programme and other stakeholders.

During the site visit, the panel studied a selection of documents provided by programme. They included course descriptions, course materials, written exams, assignments and other assessments.

The panel interviewed the programme management, students, alumni, staff members, members of the Programme Committee and members of the Examinations Board. Prior to the site visit, both staff members and students were informed about the opportunity to speak to the panel confidentially during the 'consultation hour'. No requests were received for the consultation hour.

After the final meeting with the management, the panel members extensively discussed their assessment of the programme and prepared a preliminary presentation of the findings. The site visit was concluded with a presentation of these preliminary findings by the chair.

Report
After the visit, the secretary produced a draft version of the report. She submitted the report to the panel members for comments. The secretary processed corrections, remarks and suggestions for improvement provided by the panel members to produce the revised draft report. This was then sent to Maastricht University to check for factual errors. The comments and suggestions provided by the programme management were discussed with the chair of the assessment panel and, where necessary, with the other panel members. After incorporating the panel's comments, the secretary compiled the final version of the report.

Definition of judgements standards
In accordance with the NVAO's Assessment framework for limited programme assessments, the panel used the following definitions for the assessment of both the standards and the programme as a whole.

Generic quality
The quality that, in an international perspective, may reasonably be expected from a higher education Associate Degree, Bachelor's or Master's programme.

Unsatisfactory
The programme does not meet the generic quality standard and shows shortcomings with respect to multiple aspects of the standard.

Satisfactory
The programme meets the generic quality standard across its entire spectrum.

Good
The programme systematically surpasses the generic quality standard.

Excellent
The programme systematically well surpasses the generic quality standard and is regarded as an international example.

SUMMARY JUDGEMENT BACHELOR'S PROGRAMME BIOMEDICAL SCIENCES

The bachelor's programme Biomedical Sciences at Maastricht University was in the transition to a new curriculum at the time of the site visit. The bachelor's programme introduced the new curriculum of the first bachelor year in September 2016. The panel has therefore included both the old and new curriculum in its evaluation, but with an emphasis on the new curricula for standard 1, 2 and 3.

Standard 1
The bachelor's programme has the following distinguishing features: Problem-Based Learning (PBL) approach, development of academic competences and attitude, application of a multidisciplinary, integrated approach with a focus on health and disease, and the programme is taught in English. The panel is very positive about the clear focus on PBL, explicit vision on internationalisation and the introduction of longitudinal skills training.

The intended learning outcomes (ILO's) are formulated according to the Dublin descriptors and the Domain Specific Framework (DSF). The programme adopted four main competences as ILO's, referred to as BIOMEDs. The panel strongly values the set-up of the new bachelor's programme, which is based on constructive alignment and competences. It took courage to give equal attention to both content and skills. The four competences are well designed and are internalised by students and teaching staff.

Standard 2
The panel is overall very positive about the new curriculum, despite some growing pains that can be expected with the introduction of a new curriculum. The courses are well thought through and show a clear build up in knowledge and complexity. General academic skills are organised longitudinally throughout the three years of the bachelor's programme. The topics in these longitudinal lines are related to the courses that are running at the same time. Combined, the courses and lines provide a very coherent programme. The panel observes a clear increase in level and complexity in the skills throughout the curriculum.

Maastricht University is known for its Problem Based Learning (PBL) approach, which requires a high degree of discipline and self-organisation from the students supporting the development of good learning skills and a professional attitude. The panel observed that indeed PBL is at the centre of the curricula with dedication from both teaching staff and students.

The bachelor's programme has to deal with fluctuating student enrolment numbers - with up to 400 students in the present academic year. This puts the organization of the programme under pressure, and the panel is concerned that this might negatively impact the quality of the programme in case insufficient precautions are taken. The entry level of students (both Dutch and international) is adequate and due to the mentoring system, issues are easily detected and solved. The educational concept (PBL approach and constructive alignment) and guidance of students are well organised and the panel has high expectations about the constructive alignment in the curriculum, focusing on competences. The panel recommends the programme to pay more attention in the curriculum to career opportunities outside academia.

The quality of teaching staff is good with respect to content and recent developments in the discipline since teaching staff is involved in research and is part of the academic community. There is also ample attention to the didactic quality of teaching staff. Nevertheless, the panel would like to point out that with increasing numbers of tutor groups, more time and attention is required to obtain consistency between these groups within a course. Another issue is the motivation of the teaching staff to repeatedly give a lecture or practical within one course. The panel is of the opinion that although workload is currently very high for teaching staff, it is still manageable. It is worried, however, that the quality of the programme might reduce in the near future without a proactive policy. The programme management is aware of this issue.

Standard 3
The panel is very positive regarding the vision and concept of assessment in the bachelor's programme. The longitudinal lines are well developed and the panel is impressed by the courage of the programme to explicitly combine the assessment of competences with the assessment of content. The panel is furthermore positive with respect to the frequent formative tests in the programme and the rubrics of a number of courses the panel reviewed are good.

The Board of Examiners has a clear and adequate vision on its tasks and responsibilities and is able to execute its (legal) tasks. The panel is also positive about the consulting role of the assessment expert within the programme. The panel urges the programme to introduce a sample survey of the bachelor's thesis to verify and guarantee the quality of thesis assessments.

Thesis assessment is being reviewed by the programme. Thesis criteria are re-evaluated, in particular to better differentiate between a master's and bachelor's thesis, to consider the use of rubrics and to optimise transparency in the weighing of grades and allocation of EC's for internship, presentation and thesis. The panel thinks the review and subsequent adjustments will contribute to the continued safeguarding of thesis assessment quality, transparency and reliability of thesis assessments. The introduction of rubrics as soon as possible is strongly recommended by the panel.

Standard 4
The panel concluded that the 15 selected theses pass according to the academic bachelor's level and verified that the quality of a number of theses complied with the grading "good" by the programme, others were at satisfactory level. Taking into consideration the short duration of the internship, the panel is of opinion that the level of bachelor's theses fulfil the level of the bachelor's graduate. Two theses were considered weak by the panel. However, both these theses were assigned a resit, indicating that either first, second or both UM assessors agreed that the theses were weak. The panel considers that an improvement of both theses that would result from a resit, would have them pass the requirements for a bachelor's thesis.

The majority of the bachelor's students continues with a master's programme, although only 25% of the graduates continues in the master's programme Biomedical Sciences at MU. By focusing on skills and competences, the bachelor's programme does prepare students for the labour market.

SUMMARY JUDGEMENT MASTER'S PROGRAMME BIOMEDICAL SCIENCES

The master's programme Biomedical Sciences at Maastricht University was in the transition to a new curriculum at the time of the site visit. The master's programme introduced the new curriculum of the first year in September 2017.

Standard 1
The redesigning of the master's programme Biomedical Sciences was implemented to more strongly focus on internationalisation and working in international contexts, and to train students in competences that meet the requirements set by future employers and society. The master's programme is set up in five different specializations, allowing students to develop themselves in an area of their interest.

The panel establishes that the ILO's of the master's programme follow the national Domain Specific Framework (DSF) and are of academic orientation and master's level. Although it is understandable that the revision of the programme is executed in two phases, the panel would have appreciated to already see the continuation of the competence-based, longitudinal training of skills from the bachelor's programme into the master's programme. The master's programme strongly focuses on research. Although it not exclusively trains students for (international) academia, the attention given to careers outside research is limited. The panel recommends the programme management to somewhat broaden the scope and include links to, for example, NGO's, industry, or business into the programme.

Standard 2
The revision of the master's programme was considered necessary in order to align the aims, instruction formats and assessment. Another motivation to change the curriculum was the fact that students were not able to choose a specialisation early in the programme. Although skills and competences in the old curriculum are adequately present in the curriculum, they are somewhat fragmented. The panel expects that the introduction of longitudinal lines in September 2018 will improve this and lead to an even more coherent programme, that allows students to have clear insight in their own developments.

The fact that the master's programme has both a Junior and Senior Practical Training was on multiple occasions mentioned as a positive aspect of the programme. The panel agrees, the JPT allows students to gain 'hands-on' experience in the execution of research as part of an ongoing research project. It is, however, not easy for all students to find a JPT. This issue is becoming more problematic since it is also valid for the bachelor's internship and the fact that JPT and the bachelor's internship are planned at the same period. The panel recommends the programmes to reconsider the planning of these courses to deal with this problem, but considers the two practical training periods a strength of the programme and emphasizes the continuation of both JPT and SPT.

Similar to the bachelor's programme, the panel is positive with respect to the revision of the master's programme. The panel thinks that providing five specialisations early in the programme was a good decision. From the interviews it became clear that each specialisation is doing well, and will only require minor adaptations in the next year.

The panel considers that the programme should pay attention to a more explicit focus on non-academic career perspectives and entrepreneurship. The focus on competences in the new curricula makes the students well prepared for such positions.

Standard 3
The vision on assessment in the master's programme is clear and straightforward, which is explained by not yet having introduced longitudinal skills lines. In the master's programme the various modes of assessment are in line with the PBL approach to education. The panel reviewed a number of

courses in more detail and noticed that the use of rubrics is certainly supporting the assessment of the courses.

The Board of Examiners has a clear and adequate vision on its tasks and responsibilities and is able to execute its (legal) tasks. The panel is also positive about the consulting role of the assessment expert within the programme. The panel urges the programme to introduce a sample survey of the master's thesis to verify and guarantee the quality of thesis assessments.

The assessment of the master's thesis is performed by the institutional supervisor and by a second, independent examiner. Each examiner gives a total of eight marks, five related to the form-content relation and three marks for form aspects. Students also present and defend their thesis by means of a poster presentation during the MOSA conference, which is assessed by six independent jurors. The panel complements the master's programme on the thorough and transparent assessment procedure of the SPT and thesis. The verifiability of the assessment forms of the thesis is good. Also for the master's thesis, the panel strongly recommends to introduce a rubric for the assessment of theses as soon as possible.

Standard 4
The panel verified and confirmed that the ILO's of the master's programme are operationalised and assessed in the curriculum. The panel is specifically impressed by the build-up in the curriculum towards the master's thesis. According to the panel, the introduction of the five specializations in the master's programme may be beneficial on the level of the master's student. After a common course, students get ample opportunity to become well trained specialists with in-depth knowledge and skills.

The panel read 15 selected theses and concluded that the vast majority was of high quality and represented the well-designed projects in the SPT. Some of the theses read by the panel are considered eligible for re-writing in an article. About 60% of the graduates continues with a PhD after graduation, which indicates and partly justifies the strong focus on research and academic career perspectives in the master's programme. The panel concludes that alumni possess a more wide and impressive variety of employers and positions.

The panel assesses the standards from the *Assessment framework for limited programme assessments* in the following way:

Bachelor's programme Biomedical Sciences

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment	satisfactory
Standard 4: Achieved learning outcomes	satisfactory
General conclusion	satisfactory

Master's programme Biomedical Sciences

Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment	satisfactory
Standard 4: Achieved learning outcomes	good
General conclusion	satisfactory

The chair and the secretary of the panel hereby declare that all panel members have studied this report and that they agree with the judgements laid down in the report. They confirm that the assessment has been conducted in accordance with the demands relating to independence.

Date: 2 April 2018

Prof. dr. John Creemers

Dr. Meg Van Bogaert

DESCRIPTION OF THE STANDARDS FROM THE ASSESSMENT FRAMEWORK FOR LIMITED PROGRAMME ASSESSMENTS

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.

Explanation:
The intended learning outcomes demonstrably describe the level of the programme (Associate Degree, Bachelor's, or Master's) as defined in the Dutch qualifications framework, as well as its orientation (professional or academic). In addition, they tie in with the regional, national or international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme.

Findings
Education at Maastricht University (UM) is based on the principles of Problem-based Learning (PBL), aimed at meaningful learning and at increasing knowledge transfer. Also the bachelor's and master's programmes in Biomedical Sciences focus on the PBL approach. The central concepts applied within PBL are contextual, constructive and collaborative learning. Students develop the learning attitude and skills to acquire relevant knowledge and to solve problems.

Both the bachelor's programme and master's programme Biomedical Sciences at Maastricht University were in the transition to a new curriculum at the time of the site visit. The bachelor's programme introduced the new curriculum of the first bachelor year in September 2016 and of the second bachelor year in September 2017. The first master year of the new curriculum started in September 2017. Both programmes have not yet run the final one and a half year of the new curriculum. The panel has therefore included both the old and new curricula of the programmes in its evaluation, but with an emphasis on the new curricula for standard 1, 2 and 3.

Bachelor's programme Biomedical Sciences
The design of the new bachelor's curriculum focuses on the training and education of students who not only have knowledge and understanding of the rapidly changing biomedical field, but also can develop their competences as communicators, investigators and professionals. The bachelor's programme fits the Domain-specific Framework of Reference (DSF) that was setup by the Dutch Biomedical Sciences programmes, and in addition has the following distinguishing features:

1. The content and knowledge oriented programme focuses on providing the skills required to become life-long learners. The basis for this approach is formed by the Problem-Based Learning (PBL) approach;
2. The programme aims at developing academic competences and an academic attitude, including organisational skills, communicative skills, and scholarly and professional potential. By using an electronic portfolio as an instrument, students receive feedback and are supported in their self-reflection;
3. The programme applies a multidisciplinary, integrated approach with a focus on health and disease;
4. The programme is taught in English, in line with an internationally oriented bachelor's programme. Students work in tutorial groups with students of different origins, cultural backgrounds and thus al have distinguished contributions to offer to the group.

From the interviews during the site visit, the panel consistently received input on the added value of the PBL approach. Both students, staff and programme management emphasized that although plenary lectures and other educational methods are used, the PBL approach is one of the major assets of the programme. For PBL to work properly, tutor groups should not surpass the number of 12 students. Despite the increasing student numbers (see also Standard 2), the Faculty has managed

to keep the size of the tutor groups below this threshold. The panel considers this to be very positive, since the PBL approach is fundamental to the programme and requires small groups of students.

Another positive aspect of the bachelor's programme, mentioned by both students and staff, is the international focus. The panel observed that the change to an international oriented bachelor's programme includes more than only teaching in English and the programme managed to introduce an international classroom.

The intended learning outcomes (ILO) are provided in appendix 3 and are formulated according to the Dublin descriptors and DSF. The programme was also inspired by the CANMED competences used in medical education programmes. Four competences were adopted as ILO's, referred to as BIOMEDs. Students are expected to expand their competences in each of these areas. During the site visit the committee learned that although the skills are now explicitly and coherently present in the ILO's, the previous curriculum already contained a large amount of skills training. With the new ILO's and curriculum, the implicit focus on skills is now translated in competences and longitudinal lines throughout the curriculum. The four BIOMED competences are:

- Biomedical Expert (B-competence): graduate demonstrates and effectively applies knowledge of biomedical sciences;
- Investigator & Scholar (I-competence): graduate is interested and inquisitive, shows willingness and curiosity to explore and find answers, and has developed critical thinking as well as basic research and problem-solving skills. He/she is willing to disseminate knowledge and understands how scientific knowledge is obtained and how it evolves;
- Communicator & Collaborator (C-competence): graduate can communicate about his/her work with persons from different backgrounds and can work in a team of colleagues from various disciplines and with diverse societal and cultural backgrounds;
- Professional & Organiser (P-competence): graduate has a professional attitude to his/her work and in the relation to others. She/he is organised and can organise his/her work and research.

The panel establishes that the ILO's of the bachelor's programme follow the national Domain-specific Framework of Reference for Biomedical Sciences and are of academic orientation and bachelor's level. The panel strongly values the set-up of the new bachelor's programme, which is based on constructive alignment and competences. The objective and vision to not only focus on content but also explicitly focus on skills, shows courage and dedication according to the panel. The choice of the four competences is well thought through and although the combination of ILO's and competences is rather complex, the design is good. It was striking to the panel that the ILO's and competences were not merely a paper exercise, but were already internalised by students and teaching staff.

The majority of the graduates of the bachelor's programme continues its education with a master's programme, often with the focus to continue with a PhD. Nevertheless, the panel is of the opinion that the focus on competences in the bachelor's programme can help to prepare students for a career outside academia. The programme management informed the panel that in 2018 an educational minor will be introduced, aimed at students who want to have a career as a teacher. The panel considers this to be a good development.

Master's programme Biomedical Sciences
The redesigning of the master's programme Biomedical Sciences was considered necessary to more strongly focus on internationalisation and working in international contexts, and to train students in competences that meet the requirements set by future employers and society. The master's programme is set up in five different specializations, allowing students to develop themselves in an area of their interest. The choice for these five specializations was based on common denominators, identified after a consultation process with various stakeholders who reflected on the specific areas in which their field of expertise will move in the upcoming 25 years. Finally, the changing expectations for biomedical scientists towards their discipline and familiarity with related disciplines was reason to focus on a multidisciplinary character in all five specializations. More information on the specializations is provided in standard 2.

The revision of the master's curriculum follows a two-phase approach, which is also reflected in ILO's. In the first phase, introduced in September 2017, focus lied on development of the biomedical content, structure between and within courses and embedding of the five specializations. The second phase will be introduced in September 2018 and concludes with the definite step towards full implementation of portfolio-based assessment of competences per September 2019. Notwithstanding the second phase not yet being implemented, competences are part of the present ILO's. Similar to the bachelor's programme, the panel observed a dedication to the PBL approach and to the international classroom in the master's programme. The panel considers both aspects strong features of the programme.

The ILO's for the master's programme are provided in appendix 3 and have been formulated according to Dublin descriptors and DSF. The panel considers these present general ILO's to be adequate for the master's programme. However, it expects that the ILO's that are currently being developed and are based on competences will, similar to the bachelor's programme, even better reflect the constructive alignment and corresponding competences that are foreseen. The panel is of the opinion that the introduction of five specializations was a good decision, it provides structure and focus in a previously very general master's programme. The ILO's for the courses are well described in the course descriptions the panel examined.

The panel establishes that the ILO's of the master's programme follow the national Domain-specific Framework of Reference for Biomedical Sciences and are of academic orientation and master's level. Although it understands the fact that the revision in the programme is executed in two phases, it would have appreciated to already see the continuation of the competence-based, longitudinal training of skills.

The master's programme strongly focuses on research. Although it not exclusively trains students for (international) academia, the attention given to careers outside research is very limited. The panel recommends the programme management to somewhat broaden the scope and include links to, for example, NGO's, industry, or business into the programme. All students, also those who continue with a PhD after graduation, will benefit from knowledge and understanding of the non-academic career perspectives and entrepreneurship. Based on the positions of alumni, the panel considers that the master's programme does prepare students for a broad range of positions. The master's programme could well use these alumni to strengthen the non-academic career perspectives in the programme.

Considerations

Bachelor's programme in Biomedical Sciences

The constructive alignment, and the use of four competences and accompanying ILO's in the bachelor's programme are very well devised according to the panel. It took courage to explicitly give equal attention to content and skills by formulating the four competences. The panel concludes that the ILO's were well thought through and fit those of an academic bachelor's programme very well. The panel is furthermore positive about the clear focus on PBL, explicit vision on internationalisation and the introduction of longitudinal skills training. Despite strong focus on continuation in a master's programme after graduation, the panel considers students to be well prepared to start a career outside academia.

Master's programme in Biomedical Sciences

The revision of the master's programme is still in development. The present ILO's are certainly adequate and prepare students for a position at academic master's level in biomedical sciences. The introduction of five specializations in the first phase of the revision provided focus to the programme. The panel expects that the upcoming second phase of the revision will lead to a master's programme that is as well devised and thought through as the bachelor's programme currently is, including matching ILO's based on competences. The PBL approach and international classroom are present strengths that certainly should be contained. The strong focus on research in the programme, for example the fact that many students consider a PhD position after graduation, is in line with the research focus. The career perspectives outside academia should be more exposed throughout the programme.

Conclusion
Bachelor's programme Biomedical Sciences: the panel assesses Standard 1 as 'good'.
Master's programme Biomedical Sciences: the panel assesses Standard 1 as 'satisfactory'.

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.

Explanation:
The intended learning outcomes have been adequately translated into educational objectives of (components of) the curriculum. The diversity of the students admitted is taken into account in this respect. The teachers have sufficient expertise in terms of both subject matter and teaching methods to teach the curriculum, and provide appropriate guidance. The teaching-learning environment encourages students to play an active role in the design of their own learning process (student-centred approach).

Findings
Curriculum and teaching-learning environment bachelor's programme Biomedical Sciences
In year 1 and 2 of the bachelor's programme, the new curriculum has been introduced, in 2018-2019 year 3 will start. For this report the panel reviewed year 1 and 2 of the new curriculum and year 3 of the old curriculum. The changes in the third year in the new curriculum are expected to be limited.

The programme comprises six semesters; each semester consists of three periods (2x8 weeks and 1x4 weeks). The B-competences and a large part of the I-competences are organised within this course structure, whereas P- and C-competences are developed in longitudinal trajectories. Assessment follows this general setup. Semesters 1-3 offers common courses to all students, succeeded by an elective period (semester 4). In semester 5 students can further develop their biomedical profile in a minor period, or choose a MU-wide minor. Within the biomedical sciences there are three minors available, drug intervention, nutrition intervention and physical activity intervention. A fourth, educative minor will start in 2018 as a UM wide minor. But, students can also opt for other UM wide minors, like the entrepreneurial minor or may look for a suitable minor elsewhere. Semester 6 is mainly dedicated to writing a thesis and internship/research assignment. The curriculum provides a broad foundation in biomedical sciences.

The 8-week courses of semester 1-3 cover content that is essential for all graduates, which are the five topics that together characterise (human) life: understanding the essentials of living, maintaining life by obtaining and processing nutrients and managing internal balances, interacting with the world outside the body, multiplying life and protecting life from the threats of viruses and bacteria. In the final 8-week course in semester 3, insights from the earlier courses are applied to the understanding of the development of human life, from young child to aged senior. The 4-week courses address statistical and methodological subjects. Students start the final semester with a training in a biomedical method of their own choice. Writing a bachelor's thesis is scheduled in the final two courses of the sixth semester (12 weeks). More information on the thesis is provided in standard 4.

The panel is overall very positive about the new curriculum, despite some growing pains that can be expected with the introduction of a new curriculum. The courses are well thought through and show a clear build up in knowledge and complexity. Combined with the longitudinal lines the courses provide a very coherent programme. A number of courses were looked at in more detail by the panel, all providing a positive view on the curriculum. The first course of the programme, LEGO bricks contained a lot of information, but all important basic themes were dealt with. In the course on Human Genetics, the integration with the longitudinal line on philosophy and ethics is clearly present. Practical skills are trained throughout the courses. In the new curriculum the amount of practical training within the courses is somewhat reduced, which will be compensated by a six week training

in year 3 on learning a biomedical technique or skill that is required for the internship. As the third year of the bachelor's programme did not yet start, the panel cannot verify this construction. The panel emphasized the importance of all graduates learning all relevant (basic) techniques in the bachelor's programme.

General academic skills are organised longitudinally throughout the three years of the bachelor's programme. These involve statistics and methodology, philosophy and relevant ethical topics, bioinformatics and systems biology and scientific communication. The topics in these longitudinal lines are related to the courses that are running at the same time. The panel thinks that the longitudinal skills lines are very well integrated within the courses that focus more on biomedical content. At the same time the panel observes a clear increase in level and complexity in the skills throughout the curriculum. These longitudinal lines include regular feedback moments on products and attitude that students can use to reflect upon and to develop themselves throughout the programme. The panel was specifically impressed by the writing assignments.

Curriculum and teaching-learning environment master's programme Biomedical Sciences
In September 2017 the first year of the revised master's curriculum was introduced. The revision was considered necessary in order to align the aims, instruction formats and assessment of the programme. Another motivation to change the curriculum was the fact that students were not able to choose a specialisation early in the programme. Although skills and competences in the old curriculum are adequately present in the curriculum, they are somewhat fragmented. The panel expects that the introduction of longitudinal lines will improve this and lead to a coherent programme, that allows students to have clear insight in their own developments.

The outline of the new curriculum is provided in appendix 4 and starts with an 8-week course which serves as an integrated starting point for all students. Thereafter students enrol in two consecutive 8-week courses in one of the following five specialisations:

- Genetics and Genomics;
- Inflammation and Pathophysiology;
- Nutrition, Physical Activity and Metabolism;
- Regenerative Medicine;
- Imaging from Molecule to Men.

Students are informed about the specialisations during master's open days, descriptions of specialisations on the website and a broad introduction lecture in the first week of the programme. There are also opportunities to consult the specialisation coordinators during an information market in the first course period. The second semester of the first year starts with a 4-week course in which approaches to scientific research design and techniques are being studied, including a Safe Microbiological Techniques (SMT) training. This course is followed by the Junior Practical Training (JPT). The second year of the master's programme intends to train graduates to become independent researchers. This year will not be extensively revised, although alignment with the first year will be improved. Year 2 starts with the course *Designing Scientific Research* in which students write an individual research proposal. The major part of year 2 (32 weeks) is dedicated to the Senior Practical Training (SPT) and writing of the thesis.

Similar to the bachelor's programme, the panel is positive with respect to the revision of the master's programme. As mentioned before, the longitudinal lines on competences still have to be introduced. Evidenced by the successful introduction of longitudinal lines in the bachelor's programme, the panel is confident that the programme will manage to do this without major problems. The panel thinks that providing five specialisations early in the programme was a good decision. From the interviews it became clear that each specialisation is doing well, but will require minor adaptations in the next year. The major issue that should be dealt with is repositioning (and perhaps renaming) the imaging specialisation to attract more students.

The panel looked at a number of courses in more detail and evaluated these courses very positive. Especially the writing a research proposal course is considered a very good course by the panel, which was confirmed by the students. The panel furthermore was positive on the MOSA conference in year 2, where students have to present a poster on their SPT and thesis.

The fact that the master's programme has both a Junior and Senior Practical Training was on multiple occasions mentioned as a positive aspect of the programme. The panel agrees, the JPT allows students to gain 'hands-on' experience in the execution of research as part of an ongoing research project. Students stated to be better prepared for the SPT after having done a JPT. It is, however, not easy for all students to find a JPT. The database in which students can look is not always up to date according to the students and the panel understands that supervisors might not want to have too many students for 'only' 12 weeks. This issue is becoming more problematic since it is also valid for the bachelor's internship and the fact that JPT and the bachelor's internship are planned at the same period. In fact, having to find internships for both the bachelor's and the JPT for an increasing number of students is a major challenge that should be dealt with. However, with increasing numbers of students and combining JPT and bachelor's thesis in the same period, there is high probability that not enough positions can be found for all students. The panel recommends the programmes to reconsider the planning of these courses to deal with this problem, but considers the two practical training periods a strength of the programme and emphasizes the continuation of both JPT and SPT.

The panel considers that the programme should pay attention to a more explicit focus on non-academic career perspectives and entrepreneurship. From the information provided to the panel, it concluded that alumni not only hold positions as PhD students or academic researchers, but also hold a wide and impressive range of positions outside academia. As mentioned previously in this report, the focus on competences in the new curricula makes the students well prepared for such positions. Students and staff did, however, inform the panel on the fact that during the programme (too) little attention is given to career opportunities in industry, business, NGO's or governmental organisations. The panel recommends to include non-academic career perspectives into the (master's) curriculum and make use of alumni to inform students on the possibilities and options. One option that could be explored is to allow students to use their JPT to experience research environments outside academia.

Conclusion on bachelor's and master's curriculum

Overall the panel is positive about the new curricula of the bachelor's and master's programme. It considers these curricula to be a clear improvement to the previous curricula. It is impressed by the fact that the programmes managed to introduce two new curricula and dealt with the increasing number of enrolling students at the same time. The panel did observe that the curricula are being introduced under high time pressure, with deadlines that are just met. Although the feedback by staff, students and fora on the curriculum was positive, the panel did notice some problems on communication and involvement of stakeholders in the process of development and introduction of the new curricula. Successful introduction of a new curriculum is a shared responsibility and support from all stakeholders should be strived for, specifically that of fora like the educational programme committee (EPC). The panel thinks that the communication between management team and EPC could and should be improved.

Admission and intake, study ability and guidance

At the moment the bachelor's programme in Maastricht is one of two only bachelor's programme in Biomedical Sciences without *numerus fixus* and the only bachelor's programme that is being taught in English. The bachelor's programme has to deal with strongly fluctuating student enrolment numbers. In the past two academic years the programme had to accommodate between 300 and 400 enrolling students, while in 2015 only 172 students enrolled. Part of the increase is the cancelation of the *numerus fixus*, another part is an increase in international student numbers. The programme managed to deal with these high numbers of enrolling students rather well, students informed the panel that although they had more students in their cohort, they did not feel anonymous in the large group. The panel is furthermore impressed by the dedication of the programme management and of the Faculty Board that the number of students in a PBL tutor-group should not

exceed twelve. Already at the time of the site visit, the panel observed that the organisation is under pressure due to the large number of enrolling students. The expectation is that these high numbers will continue for the upcoming years, but also may flatten.

Although the programme management indicates to be aware of the issues and problems that accompany further increase of the student numbers, the panel is concerned that the quality of the programme might decrease if insufficient precautions are taken. Most urgent issues are the workload and the commitment to the programme of the teaching staff, consistency within and between courses due to the large number of staff involved, and the availability of internship positions and lab facilities. The panel recommends the programme to thoroughly and structurally take up these issues. Teaching and support staff should have sufficient time to not only do the teaching, but also to prepare and assess the courses. The panel thinks that good communication to and between teaching staff is also a prerequisite for future success.

Approximately 50% of the students that enrol in the master's programme did the bachelor's programme in Maastricht. The increase in student numbers in the bachelor's programme therefore is expected to have an effect on the number of students in the master's. Although the problem is expected to be less, since many of the bachelor's graduates opt for continuation in another master's programme. Nevertheless, increasing number of master's students will add to the challenge of the programmes and to the high workload of teaching staff.

The bachelor's programme, being taught in English, attracts international students (25-40%). The panel verified and was reassured that the entry levels of the international students are adequate. Despite differences in prior knowledge and skills, the international students seem as successful as Dutch students. Important in this success is the mentor system, which helps identify problems and solutions early on in the programme. The admission requirements for entering the master's programme are clear and the panel verified that in the master's programme there are also no major issues with respect to the academic level of international students, or students who did their bachelor's at another Dutch university. In fact, the international composition of both bachelor's and master's programmes is considered to have a positive influence on the academic level of the programmes.

The students of the bachelor's programme are positive about the study load in the programme with on average 12 contact hours per week throughout the programme. Despite some growing pains that can be expected when introducing a new curriculum, the overall feedback was positive. It became clear to the panel from the interviews that the evaluations of the courses and both formal and informal feedback are taken seriously by the programme management, leading to changes in a course in the next year. One of the objectives of the new curriculum was to increase the weekly number of hours student devote to their study. Based on the results of the first year, this was indeed accomplished. The one course that was considered too challenging is now being evaluated and adapted for the upcoming year.

In the interview with master students, the limit of 12 contact hours (on average) per week was considered inadequate for the first courses of the specialisation. Some students stated that they would have preferred more time for lectures, since the amount of information was too dense. The panel agrees with students that the amount of information provided during a lecture should not be too high, but doubts if more hours of lectures is the solution. It would rather advice the programme to either limit the information, or think of other ways to inform students (e.g. e-lectures).

In the new bachelor's curriculum the mentor was introduced: a member of teaching staff supervises and follows a group of students throughout the entire bachelor's programme. The mentoring starts with PBL training sessions with the entire group, after which the mentor and student have a number of individual meetings every year. The portfolio allows student and mentor to monitor progress on all competences and facilitates early intervention, should that be required. The panel is of the opinion that the mentor has an important role in the supervision and monitoring of the students and thinks

that the introduction in the new curriculum adds to the small scale education that is aimed for. The panel recommends to carefully monitor the experienced workload and take action where and when needed in order to maintain the sustainability of tailored feedback provision.

Educational concept
Maastricht University is known for its Problem Based Learning (PBL) approach, which challenges students to define gaps in their knowledge and come up with the learning goals required to fill these gaps. This approach requires a high degree of discipline and self-organisation from the students, which supports the development of good learning skills and a professional attitude. The panel observed that indeed PBL is at the centre of the curricula with dedication from both teaching staff and students. The tutor groups are regularly mixed, forcing students to continuously adapt to a new group. The panel agrees with the programme management that this helps students in developing their competences. With the increasing number of students the panel recommends the programmes to – without abandoning the PBL approach – look for teaching methods that might help the programmes on the long term in dealing with high numbers of students, e.g. digital lectures.

The new curricula are furthermore setup according to constructive alignment, a principle for designing Teaching and Learning Activities (TLA) and Assessment Tasks (AT). The competence-based bachelor's curriculum is already supported by an electronic portfolio. In this portfolio the student collects evidence and reflects upon formative feedback and assessments from tutors, mentors, assessors and peers on their oral and written communication skills, their professional behaviour and their organisational skills. Students who pass the portfolio assessment get assigned 10 EC for the C-competence and 10 EC for the P-competence. The B- and I-competences are assessed in course exams or with specific assignments. According to the panel the electronic portfolio is a good tool as a feedback system that provides overview to student and mentor on skills development and reflection of the student. The panel did observe that this electronic portfolio, with its large number of feedback moments and products, is very labour intensive for both student and mentor. On the one hand, the panel acknowledges that it takes time to do it well, on the other hand it has concerns about the high workload for staff members. With increasing student numbers, see also below under *admission and intake*, the workload will only increase in the upcoming years. In order not to reduce the quality of the portfolio, the panel recommends the programme to thoroughly review when feedback provision has most added value and to carefully balance the number of written feedback moments with the extend of written feedback to be provided by staff. With increasing student numbers it is important to optimize use of means: a cost-benefit analysis is recommended, as writing feedback is using a lot of time of teaching staff. In the master's programme the electronic portfolio will be introduced in September 2019, which will require more teaching staff.

Staff
The panel was impressed by the overall positive attitude it observed in its interview with teaching staff towards the new curricula and increasing student numbers. Motivation for this positive attitude, were the fact that there is lot of support with respect to planning and organisation, and the fact that teaching staff considers the new curricula to be an improvement. At the same time, the panel did notice that teaching staff is under pressure. Workload is already very high and is expected to increase in the upcoming academic year. Teaching staff informed the panel that the university wide policy changed towards 50% teaching tasks and 50% research. The increase in teaching tasks makes it more difficult than before to find a balance between teaching and research. One teacher stated that it was gathering hours to reach the required number, while intrinsic motivation to teach is pushed to the background.

The panel is pleased to learn that the management and Faculty Board provide the means to provide mentors with more hours and to attract additional teaching staff in order to keep the PBL tutor-groups to a maximum of 12 students. These examples show that the programme management is aware of the issue and looks for solutions. Nevertheless, the panel would like to point out a number of concerns for the near future with respect to teaching staff. With increasing numbers of tutor groups, more time and attention is required to obtain consistency between these groups within a

course; tutors need to be trained and have time to synchronise with the course coordinator and other tutors. Another issue is the motivation of the teaching staff to repeatedly give a lecture or practical within one course. Finally, although additional hours were provided to tutors when it became clear that insufficient time was given, this might also hold for other teaching staff within the programme like the mentor, or assessor. The panel is of the opinion that although workload is currently very high for teaching staff, it is still manageable. It is worried, however, that the quality of the programme might reduce in the near future without a proactive policy.

The quality of teaching staff is good with respect to content and recent developments in the discipline since teaching staff is involved in research and is part of the academic community. There is also ample attention to the didactic quality of teaching staff. Evaluations by students are used to address the quality of the teaching staff and there are plenty of professional development opportunities, in addition to the University Teaching Qualification (UTQ) that staff members may have to obtain. Staff members involved in certain roles in the curriculum (e.g. tutor, mentor, assessor) have to follow a mandatory course to specifically prepare for this role. In addition there are numerous courses and training opportunities for teaching staff.

Finally, the panel would like to compliment the programmes on the fact that although all staff members are expected to be involved in both teaching and research, career opportunities based on teaching qualifications are an option at some departments and the quality of teaching is part of the decision to give tenure.

Considerations
The panel is positive about the new curricula of both the bachelor's and master's programme. Content, competences, consistency and supervision are all well embedded and the curricula make it possible to obtain the ILO's. The panel complements the bachelor's programme on the longitudinal skills lines in which students clearly develop the four competences. With respect to the master's programme, the introduction of five specialisations is considered a positive development.

Unfortunately the curricula are not yet fully introduced and the final years are still being developed. The longitudinal lines in year 1 of the master's programme are also not yet introduced. The panel has no reason to assume that the quality of these final years will not be similar to the years that are already introduced. Each new curriculum has growing pains and unforeseen issues that should be resolved, the panel has no major worries in this respect. The panel thinks that the attention should be given to clear communication lines during development and introduction of the new curricula. This is even more important considering the increasing student numbers. The programmes should focus on involving all stakeholders in this major undertaking.

The entry level of students (both Dutch and international) is adequate and due to the mentoring system, issues are easily detected and solved. The panel is concerned about the effect of the high number of enrolling students on the bachelor's programme, which will also affect the master's programme in the upcoming years. At present teaching load is very high, but doable, but the panel thinks that a further increase of student numbers will affect the quality of the programmes if adequate policy measures are not taken and implemented soon. The educational concept (PBL approach and constructive alignment) and guidance of students are well organised and the panel has high expectations about the constructive alignment in the curriculum, focusing on competences. The panel recommends the programmes to pay more attention in the curriculum to career opportunities outside academia.

Conclusion
Bachelor's programme Biomedical Sciences: the panel assesses Standard 2 as 'satisfactory'.
Master's programme Biomedical Sciences: the panel assesses Standard 2 as 'satisfactory'.

Standard 3: Student assessment
The programme has an adequate system of student assessment in place.

Explanation:
The student assessments are valid, reliable and sufficiently independent. The requirements are transparent to the students. The quality of interim and final examinations is sufficiently safeguarded and meets the statutory quality standards. The tests support the students' own learning processes.

Findings
In the self-evaluation report the programme indicates how the ILO's are operationalised and assessed in the new bachelor's curriculum. The ILO's for the competences are assessed through exams and assignments or accumulated feedback including mentor meetings. Students learn to reflect on received feedback, which increases the awareness of their potential strengths and weaknesses and helps them formulate SMART learning goals to improve. The panel is very positive on the longitudinal assessment of competences, using the portfolio and mentoring system.

Vision on assessment
With developing a new bachelor's curriculum the opportunity was taken to reconsider the vision on assessment, in particular with respect to align assessment practices with the ILO's. Key features of the assessment approach are: 1) to ensure trustworthy decision-making on performance in each competence domain (electronic portfolio and rubrics-based feedback forms), 2) pass/fail decisions being corroborated by written feedback and test results in the portfolios, 3) longitudinal and modular components being combined in the assessment programme, and 4) actively involving students in feedback tasks through self- and peer-evaluation.

As mentioned in the self-evaluation report and the interviews, the new assessment programme of the bachelor's programme had some start-up problems and although changes were made, the programme management stated that there is still room for improvement. The panel agrees that improvements are indeed required to make the practice of the assessment as good as the vision. Specific point of attention is consistency between assessors in the feedback they provide in the portfolio's, which is heterogeneous. The panel considers it important that in the assessment of the portfolio each qualification is based on multiple sources of input and is reliable and reproducible. This will be even more important with the increasing student numbers, since the number of assessors will also increase. The panel is positive about the portfolio assessment committee that was installed with the task to review of portfolio assessment and training of mentors.

The panel is very positive regarding the vision and concept of assessment in the bachelor's programme. The longitudinal lines are well developed and the panel is impressed by the courage of the programme to explicitly combine the assessment of competences with the assessment of content. The panel is furthermore positive with respect to the frequent formative tests in the programme and the rubrics of a number of courses the panel reviewed are good.
The vision on assessment in the master's programme is more straightforward, which is explained by not yet having introduced longitudinal skills lines. In the master's programme the various modes of assessment are in line with the PBL approach to education: assessment supports the central concepts of contextual, constructive and collaborative learning at master's level. Formats are in place to test knowledge and skills, the application of knowledge and skills and professional behaviour. The panel reviewed a number of courses in more detail and noticed that the use of rubrics is certainly supporting the assessment of the courses.
Students were overall positive about the transparency, validity and reliability of the assessment and if any unclarities or inconsistencies were met, adequate action was taken by both programmes. Also teaching staff seems to be committed to the vision on assessment, including with respect to the labour intensive and regular (written) feedback moments.

Board of Examiners (BoE)

The BoE determines in an objective an professional manner whether a student meets the conditions imposed by the Education and Examination Regulations (EER) in relation to the knowledge, insight and skills required to obtain a degree. BoE members participated in meetings with the management team to better delineate their respective tasks, which before was unclear and a point of discussion. This has improved the dialogue with the management team and provides confidence that (future) issues will be dealt with adequately. The panel has the impression that the communication and collaboration between management team and BoE has significantly improved in the past period, which is beneficial for the verification of the quality of assessment.

From the interview the panel concludes that the BoE has a clear and adequate vision on its tasks and responsibilities and is able to execute its (legal) tasks. The panel is also positive about the consulting role of the assessment expert within the programme. With the new assessment programme the BoE is able to systematically deal with the assessment of the programmes. Furthermore, it has a clear view on what is required in the upcoming years to further improve its role within assessments. In this respect the panel urges the programme to introduce a sample survey of the bachelor's and master's thesis to verify and guarantee the quality of thesis assessments.

Procedure of internship and thesis assessment of the bachelor's programme
The bachelor's programme ends with a 12-week internship period which results in a research report (bachelor's thesis). Guidelines on procedures and criteria (form and content) for thesis and assessment are provided electronically. According to the panel these procedures and criteria are described well, the selection of theses that were reviewed by the panel have similar layout and form.

Each student is guided by a first supervisor (always a UM staff member), who also assesses the internship, the presentation of the thesis and the thesis itself. A second, independent examiner (UM staff member) assesses form and content of the thesis. Assessment of the internship, thesis presentation and both assessments of the thesis form and content have to be graded as 'sufficient' independently of each other. In case one or both examiners grade the thesis as insufficient, the thesis has to be revised. The panel is of opinion that the assessment procedures of internship and thesis are well organised and transparent.

The thesis assessment was being reviewed and adjusted around the time of the site visit. Thesis criteria are re-evaluated, in particular to better differentiate between a master's and bachelor's thesis, to consider the use of rubrics and to obtain transparency in the weighing of grades and allocation of EC's for internship, presentation and thesis. The panel thinks an adjustment is essential in order to safeguard the quality, transparency and reliability of thesis assessments. The introduction of rubrics as soon as possible is strongly recommended by the panel. Criteria that are presently used to assess bachelor's theses are adequate. However, although qualitative feedback is part of the thesis assessment form, the panel is of opinion that using a 3-point scale (insufficient, sufficient, good) is too limited to subsequently lead to a well-founded final score on a 10-point scale. The panel recommends to take this aspect into consideration when introducing a rubric and re-evaluating of the criteria.

Procedure of SPT and thesis assessment of the master's programme
During the first course of year 2, students write their SPT research proposal which is presented and defended at the end of the course. Grades are given by supervisor, independent examiner, tutor and two peers. Practical work during the SPT is formally assessed by the UM supervisor, with halfway the internship an interim assessment. The practical work is scored according to nine different criteria and the final score is the average of the sub-scores. In the case of doing the SPT outside Maastricht University, the UM supervisor verifies and – when necessary – adapts the scores proposed by the external supervisor. Students were very positive about the course in which they have to write the research proposal. The panel also considers this course an excellent preparation for the SPT and thesis, students obtain knowledge on the research topic and have to write a plan of action. It would recommend this course to function as a go/no-go moment for the SPT.

The assessment of the master's thesis is performed by the institutional supervisor and by a second, independent examiner. Each examiner gives a total of eight marks, five related to the form-content relation and three marks for form aspects. For the thesis to be considered a 'pass' all 16 constituent marks must be at least a pass. The weighted average of the 16 marks (20% form and 80% content) constitutes the final mark of the thesis. Students also present and defend their thesis by means of a poster presentation during the MOSA conference, which is assessed by six independent jurors. The average score is part of the SPT assessment.

The panel complements the master's programme on the thorough and transparent assessment procedure of the SPT and thesis. Highlights are the interim assessment of the SPT and the MOSA conference. The verifiability of the assessment forms of the thesis is good. Also for the master's thesis, the panel strongly recommends to introduce a rubric for the assessment of theses as soon as possible.

Considerations
With respect to vision on assessment, both programmes are doing well. The bachelor's programme revised its assessment programme to be in line with the revised curriculum. The panel is very positive about this new vision and assessment programme, it expects that the introductory problems will be dealt with. The master's programme vision on assessments is more straightforward, and clearly described. The use of rubrics in the assessments of courses and the electronic portfolio in the bachelor's programme are examples of improvements that were made in the assessment programmes. The BoE has a clear and adequate vision on its tasks and responsibilities and is able to execute its (legal) tasks. Communication and collaboration between management team and BoE has significantly improved in the past period, which is beneficial for the verification of the quality of assessment. The panel, however, urges the programme to introduce a sample survey of the assessment of bachelor's and master's theses as soon as possible. Both programmes have a well-constructed thesis assessment procedure. The panel also recommends to speed up the introduction of rubrics for the theses to better guarantee calibrated assessments and further improve transparency and feedback.

Conclusion
Bachelor's programme Biomedical Sciences: the panel assesses Standard 3 as 'satisfactory'.
Master's programme Biomedical Sciences: the panel assesses Standard 3 as 'satisfactory'.

Standard 4: Achieved learning outcomes
The programme demonstrates that the intended learning outcomes are achieved.

Explanation:
The achievement of the intended learning outcomes is demonstrated by the results of tests, the final projects, and the performance of graduates in actual practice or in post-graduate programmes.

Findings
Bachelor's programme Biomedical Sciences
The panel concluded that the 15 selected theses pass according to the academic bachelor's level. The panel verified that its opinion on the quality of a number of theses complied with the grading "good" by the programme, others were at satisfactory level. Taking into consideration the short duration of the internship, the panel is of opinion that the level of bachelor's theses fulfil the level of the bachelor's graduate. Two theses were considered weak by the panel. The criticism was mainly directed towards a weak abstract and discussion, but also the level of English was considered weak. However, both these theses were assigned a resit, indicating that either first, second or both UM assessors agreed that the theses were weak. The panel considers that an improvement of both theses that would result from a resit, would have them pass the requirements for a bachelor's thesis. The panel noticed major differences in the qualitative feedback that was provided by the reviewers, which

varied between no comments to clear and useful feedback. The panel is of the opinion that reviewers should provide written feedback to support the grades given and inform the student about strong points and suggestions for improvement.

The majority of the bachelor's students continues with a master's programme, although only 25% of the graduates continues in the master's programme Biomedical Sciences at MU. By focusing on skills and competences, the bachelor's programme does prepare students for the labour market. As mentioned before he panel is positive about the plans to introduce an educative minor in September 2018.

Master's programme Biomedical Sciences
The panel verified and confirmed that the ILO's of the master's programme are operationalised and assessed in the curriculum. The panel is specifically impressed by the build-up in the curriculum towards the master's thesis. The JPT prepares students for working in a research environment in the first year of the programme. Also, in the first course of year 2, students write their own research proposal. Both courses prepare students well for the SPT and writing of the thesis. This is confirmed by the positive feedback of external supervisors on level, attitude and skills of the students during the SPT. The presentation of the results at the MOSA conference is a good finalisation of the programme: students have to present and defend their work in a semi-professional atmosphere. The panel does recommend to clearly define and communicate the contribution of this presentation in the final grade.

The panel read 15 selected theses and concluded that the vast majority was of high quality and represented the well-designed projects in the SPT. One thesis only just met the requirements of a master's thesis, with poor use of English and a very weak discussion. The panel agreed with the assessment of the second reviewer and due to the clear and transparent assessment procedure, including qualitative feedback, the panel concurs the passing-grade for this thesis after revision. The master's programme strongly focuses on doing research, but none of the theses were written as a journal article. The panel considers that this is the result of clear guidelines on form and content of the theses. Although some of the theses read by the panel are considered eligible for re-writing in an article, the panel is very positive about the fact that in these theses the contribution of the student in the design and execution of the research project, as well as the writing of the thesis is very clear.

According to the panel, the introduction of the five specializations in the master's programme may be beneficial on the level of the master's student. After a common course, students get ample opportunity to become well trained specialists with in-depth knowledge and skills.

In standard 2 the panel reflects on the attention the programme should give to non-academic career perspectives in the master's programme. About 60% of the graduates continues with a PhD after graduation, which indicates and partly justifies the strong focus on research and academic career perspectives in the master's programme. However, the information on positions held by alumni that was provided to the panel during the site visit, displayed a wide and impressive variety of employers and positions. The panel thinks that the success of graduates outside academia is partly due to the focus on skills and competences during the programme. The alumni confirmed in the interview that they consider that the programme prepared them well for their future career.

Considerations
Assessment of knowledge, skills and competences are well organised in both programmes and the panel verified that all ILOmajor's are achieved and assessed throughout the programmes. The panel considers the theses of the bachelor's programme to be of satisfactory scientific level and those of the master's programme of good scientific level. Although no information was present on the number of co-authorships in scientific papers, the panel did observe a number of theses that might be rewritten into an article. The panel was specifically impressed by the combination of JPT and SPT as well as the introduction of five specializations in the master's programme.

Most bachelor graduates successfully continue with a master's programme. Most alumni of the master's programme continue with a PhD after graduation. The panel is convinced that both bachelor and master graduates are well prepared for a career outside academia. This was confirmed by the alumni during the site visit.

Conclusion
Bachelor's programme Biomedical Sciences: the panel assesses Standard 4 as 'satisfactory'.
Master's programme Biomedical Sciences: the panel assesses Standard 4 as 'good'.

GENERAL CONCLUSION

Both bachelor's and master's programme Biomedical Sciences at Maastricht University are in the middle of introducing a new curriculum. The panel is positive about the plans and the initial results of implementation. The introduction and explicit positioning of competences in longitudinal lines, specifically in the bachelor's programme, is impressive and shows courage. Another positive aspect is the broad-based support for the PBL-approach. As can be expected when introducing a new curriculum, growing pains are likely to occur. The panel is confident that the programmes will manage to overcome these issues.

One concern the panel has, is the large student intake in combination with the introduction of two new curricula and labour-intensive teaching methods and frequent feedback. Teaching load is already very high, and adequate policy measures should be taken to prevent affecting the quality in the programmes.

The vision on assessment is revised with the introduction of the new curricula and is very promising. The BoE is in control, but at the same time aware that there are some points of attention, like a sample-survey of theses and the introduction of rubrics for thesis assessments. The panel considers the level of bachelor graduates satisfactory and that of master graduates good, based on reading a sample of theses.

Combining all its findings, the panel concludes that both programmes fulfil the requirements that are set for a bachelor's respectively master's programme.

Conclusion
The panel assesses the *bachelor's programme Biomedical Sciences* as 'satisfactory'.
The panel assesses the *master's programme Biomedical Sciences* as 'satisfactory'.

APPENDICES

APPENDIX 1: CURRICULA VITAE OF THE MEMBERS OF THE ASSESSMENT PANEL

John Creemers (chair) is professor of Biomedical Science at KU Leuven, Belgium. He teaches two courses for bachelor students of Biomedical Sciences, one of which is the bachelor's thesis. His laboratory for Biochemical Neuroendocrinology is part of the Department of Human Genetics, and his research focusses on protein folding, maturation and trafficking in the secretory pathway (regulated). In particular, he specializes in inherited disorders in which these processes are disturbed. He is also director of the Doctoral School of Biomedical Sciences. He is the KU Leuven representative to the League of European Research Universities (LERU) Doctoral Studies Community and a member of the executive committee of ORPHEUS, a network of universities that is committed to developing and disseminating best practices within PhD training programmes.

Rudi D'Hooge is professor of biological psychology at the KU Leuven Faculty of Psychology and Educational Sciences (Belgium). He teaches to large groups of bachelor and master students (mostly in the Psychology, Educational Sciences, and Biomedical Sciences programmes) about neuroscience and brain disorders. He holds degrees in biology and psychology from U Antwerp and VU Brussels, respectively, including a doctorate in Biomedical Sciences and one in Psychology. He is head of the Laboratory of Biological Psychology, where his recent research focusses on the neural mechanisms of learning and memory, and the study of animal models of brain disorders. He holds and has held several administrative offices including a five-year appointment as vice-dean research, membership of the science advisory board of the university, chair and member of ethical review boards, and elected member of the selection and evaluation committee of his faculty.

Nellie Harms studied Chemistry at the University of Leiden and the VU Amsterdam. Her PhD (1988) at the Faculty of Biology at the VU Amsterdam led to a thesis, titled: Genetic and physiological studies on methanol metabolism in Paracoccus denitrificans. Harms worked as researcher and assistant professor at the VU Amsterdam where she was involved in the development of a new bahelor's programme in Health and Life (2003) and of which she was chairing the educational committee. From 2005 to 2007 Harms was project manager of WOSprint-VU and was responsible for the educational connection VO-HO. She was also part of the cooperation between four higher education institutes and 40 secondary education schools in the Amsterdam region. Between 2007 and 2017 she was director of education at the Faculty of Earth and Life sciences VU Amsterdam.

Mieke Latijnhouwers works as Assessment Advisor at the Radboud University Medical Hospital, Nijmegen, The Netherlands. She is involved in assessment development, staff training, assessment policy and evaluation research. Nationally, she is one of the two coordinators the special interest group on assessment of the Nederlands Association of Medical Education (NVMO). Originally trained as a medical biologist, in 1998 she received a PhD in medical sciences from RU based on her thesis 'Tenascin-C in skin: expression and functional aspects'. After working as sr. Project consultant at VWB intermedical, in 2003 she returned to the medical hospital as head of the Educational Coordination unit, combining organisational, executive and policy tasks regarding the biomedical curricula. In 2011 she changed roles and joined the educationalist expertise team, with assessment as her specialty.

Boas van der Putten (student-member) is a PhD candidate at the Amsterdam Institute for Global Health and Development (AIGHD). His current research interests lie in the domain of antimicrobial resistance of Escherichia coli, with a special focus on the transmission and host range of the bacterium. During his bachelor and master (both at the University of Amsterdam), he focused on infectious diseases, with research projects on latency of HIV-1 and the host range of avian influenza. He accumulated international experience during his studies by studying a trimester at the University of Washington in Seattle and conducting a six-month research project at Imperial College London. Furthermore, he was the secretary of the Board of Studies Biomedical Sciences and helped informing prospective students for the master.

Dirk Snyders is professor of Biomedical Sciences at the University of Antwerp. His research interests of the past ten years have focused on the molecular structure-function relations in Kv-channels, analyses of LQT mutations and the study of 'silent' Kv subunits. Next to his teaching and research activities, he has been active in administrative functions inside (e.g. member of the Board of Directors of the University of Antwerp) and outside the university (e.g. member of the Physiology review panel of the Research Foundation – Flanders) and is a member of various professional organizations. In 2012 he was a member of the evaluation panel for the Biomedical Sciences programmes in The Netherlands.

APPENDIX 2: DOMAIN-SPECIFIC FRAMEWORK OF REFERENCE

The biomedical sciences at bachelor and master level focus on a multidisciplinary approach of research questions pertaining to the maintenance of health and prevention of disease in man and animals. They integrate elements of the natural sciences, in particular man-associated areas of biology, chemistry, pharmacy, physics and mathematics, with the medical sciences. A continuous mutual interaction between elements from these disciplines provides the biomedical sciences with their translational character. Obtaining insight in processes at the molecular, cellular, organ and organism level both in the healthy as well as disease state is the foremost driver of biomedical sciences research. The field also encompasses studies at the population level where epidemiological qualitative approaches as well as society directed γ- approaches may be used. Furthermore, elements from the α-sciences play a role in degree programs in the biomedical sciences domain (see Figure 1).

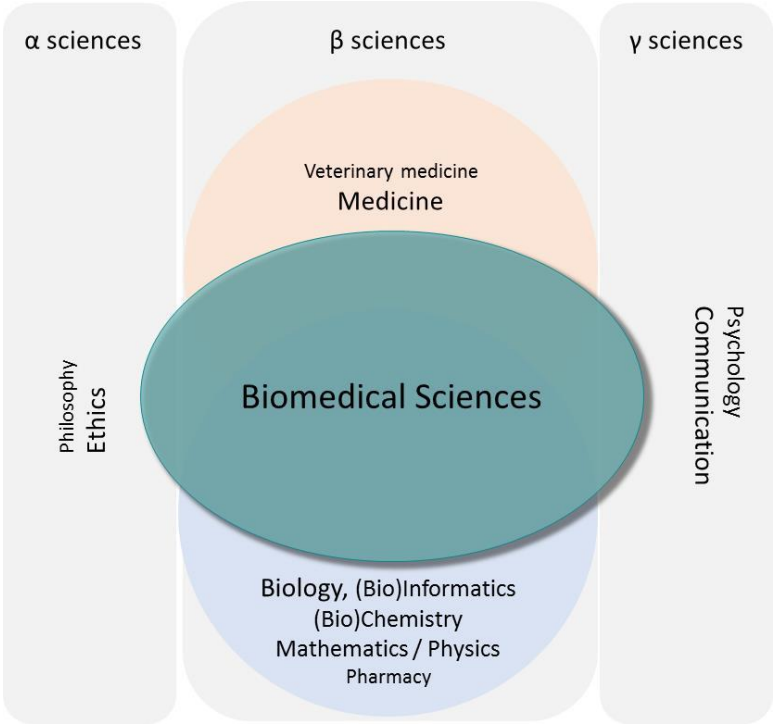


Figure 1. The multidisciplinary field of biomedical sciences. Text size correlates with the position of the indicated discipline within Biomedical Sciences.

For each scientific discipline the proper demarcation is nowadays a challenge given the rising importance of interdisciplinary approaches to address scientific and societal challenges. The multidisciplinary field of the biomedical sciences is no exception to this. Due to its translational character, the strength of the biomedical sciences lies in seamlessly connecting parts of the different core-disciplines. Hence the biomedical domain covers many elements from different disciplines and is primarily characterised by a profound integration of these elements.

Biomedical research thus provides innovative options for health maintenance and disease prevention based on developing insight in the biological processes that govern life. This is for instance seen in research areas such as cell division mechanisms, the interaction between man and microbe as well as aging.

In addition, biomedical sciences focus on the translation of clinical challenges or challenges in the field of public health to experimental research approaches that aim at the provision of a deep understanding of the biological mechanisms that are at the basis of these challenges.

The overall aim is to provide a scientific mechanistic basis for optimal health maintenance throughout life, as well as the improvement of diagnosis and treatment of disease.

At some of our universities the 2-year master programmes in the field of biomedical sciences have specializations in Management, Communication and Education. Within the current reference framework these specializations focus on respectively (research) management in a commercial setting, societal aspects of research and knowledge acquisition.

APPENDIX 3: INTENDED LEARNING OUTCOMES

In addition to the joint ILO's in DSF, described below, the bachelor's programme described ILO's related to the BIOMED competences. The four competences are:

- Biomedical Expert
- Communicator (combining Collaborator and Communicator)
- Investigator (combining Investigator and Scholar)
- Professional

For each of the latter three competences, four sub-competences have been defined, and per year, the ILO's for each sub-competence have been formulated. In the self-evaluation report the ILO's for each sub-competence are described in detail.

Learning outcomes for the bachelor's respectively master's programmes, jointly described by the Dutch universities offering a bachelor's and/or master's programme in Biomedical Sciences (part of the domain-specific framework of reference). These learning outcomes have been formulated according to Dublin descriptors.

Bachelor's programme Biomedical Sciences:

The bachelor has knowledge and understanding in the field of
- the biological, mechanistic and etiological basis of human or animal health and illness;
- the broad methodological basis for biomedical research (from laboratory techniques to the use of model systems, statistics and epidemiology);
- translating clinical problems into both fundamental and clinically related biomedical research, and the translation of results of biomedical research (both human and animal) into relevant applications in the diagnosis, treatment and prevention of illness;
- the contextual position of the field of biomedical sciences as such, i.e. from an epistemological, historical, ethical and/or social perspective.

Application of knowledge and understanding
The bachelor
- can apply qualitative, quantitative and statistical techniques in biomedical research;
- can gather data and analyse it qualitatively and quantitatively;
- can use the relevant computer software;
- can define a specific biomedical question, develop hypotheses and formulate explanations;
- can, under supervision, formulate and implement a scientific research plan for a project/internship.

Making judgements
The bachelor
- can read, understand and critically evaluate biomedical professional literature;
- can assess the value of the biomedical data that has been gathered and evaluate its applicability;
- is, to a certain extent, capable of evaluating whether biomedical laboratory techniques or clinical and other research models are suitable for and applicable to a problem;
- can form a judgement on biomedical questions based in part on a consideration of the relevant social, clinical, scientific or ethical aspects;
- can establish connections between biomedical issues and adjacent fields of study (e.g. medicine, biology, pharmaceutical sciences);
- understands the historical and philosophical perspectives of the sciences, particularly biomedical sciences.

Communication
The bachelor
- can communicate with fellow specialists and non-specialists both orally and in writing in Dutch and
- English;
- can make a substantive contribution to a scientific discussion;
- can form a reasoned opinion and defend it;
- can operate both individually and as part of a group and work on multidisciplinary topics;
- can provide peer feedback.

Learning skills
The bachelor
- can independently and effectively acquire knowledge and understanding of previously unfamiliar biomedical issues;
- can operate at an academic working and thinking level; can and wants to develop this level further;
- understands the need and is able to keep up to date with relevant developments in the field;
- can and is inclined to find scientific explanations;
- is capable of multidisciplinary thinking and can establish links;
- can reflect on his/her own development and academic career to make well-considered choices for a follow-up programme;
- can reflect on his/her own actions and deal with peer and other feedback.

Master's programme Biomedical Sciences

General intended learning outcomes of the M-BMS
Increasing knowledge and understanding
- Broad and thorough knowledge and understanding of the molecular processes involved in homeostasis, cell–cell communication, signal transduction, cell proliferation and cell death.
- Detailed knowledge of the molecular processes involved in gene expression (transcription, translation, post-translation epigenetics).
- Knowledge of relevant modern technologies (genomics, proteomics, transgenesis and transcription, imaging).
- Mastery of the main molecular pathobiological theories and models for the onset of chronic diseases, and understanding of the integration of research models and theories from various disciplines.
- Knowledge and understanding of important factors in people's environments that can threaten and benefit their health, as well as of the molecular processes that lead to biological availability and their interaction at target protein level in the human body.
- Understanding of and experience with the (biostatistical) processing of research results from laboratory and/or population studies.
- Understanding of ethical issues in relation to the discipline and translational research.
- Understanding of the basic principles of entrepreneurship and intellectual property.

Application of knowledge and understanding
- Insight into and experience in designing an academic research project.
- Understanding of and experience in independently setting up and carrying out scientific research (hypothesis, problem definition, approach).
- Theoretical and practical experience in a broad range of modern laboratory techniques for molecular biomedical research.
- Experience in designing and evaluating experimental research models and theories (evidence based, logical reasoning).
- Experience in reporting research results in a precise and clear manner (in accordance with standard structures).

- Experience in planning and organising research (independent setup of research, including the methods and materials needed).
- Active participation in academic discussions (progress reports, research planning).
- Fundamental knowledge and practical skills to work safely in a potentially hazardous laboratory environment.

Development of independent, critical thinking
- Critical analysis of scientific publications (hypothesis, problem definition, approach, interpretation of results, conclusions, limitations).
- Interpretation and critical evaluation of research results obtained, derivation of new scientific insights.
- Maintenance of high professional and academic standards.

Development of communication skills
- Ability to communicate (through oral presentations and detailed academic reports in scientific English) with academics from their own and related disciplines.
- Ability to enter into a dialogue about the relevant discipline with broad social groups.
- Ability to cooperate in multidisciplinary teams with focused assignments.
- Ability to meet deadlines.

Development of self-directed learning skills
- Ability to independently maintain and extend professional knowledge and competences.
- Work experience in various research laboratories.
- Experience with professional mobility.

APPENDIX 4: OVERVIEW OF THE CURRICULUM

Bachelor's programme Biomedical Sciences:

<table>
<tr><th></th><th>Year 1</th><th colspan="3">Year 2</th><th>Year 3</th></tr>
<tr><td rowspan="2">8 weeks</td><td rowspan="2">1.1 The LEGO® bricks of life

B-competence

C- and P- competence
I.e. tutorials, project,
Scientific writing assignment</td><td colspan="3" rowspan="2">2.1 Threat and defence mechanisms

B-competence

C- and P-competence
+ Poster presentation

I-competence
Statistics</td><td>Minor period
From global diversity to personal intervention
B-C-I-P competences</td></tr>
<tr><td>3.1 Diversity and epidemiological aspects

I Drugs | II Nutrition | III Physical Activity</td></tr>
<tr><td rowspan="2">8 weeks</td><td rowspan="2">1.2 Homeostasis & organ systems

B-competence

C- and P-competence</td><td colspan="3" rowspan="2">2.2 From cradle to grave

B-competence

C- and P-competence
+ Presentation training

I-competence
SoPhiA</td><td>3.2 Molecular depth of interventions

I Drugs | II Nutrition | III Physical Activity</td></tr>
<tr><td></td></tr>
<tr><td>4 weeks</td><td>1.3 Introduction to statistical methods for data analysis

I-competence</td><td colspan="3">2.3 Non-invasive techniques in BMS research

I-competence
B-competence</td><td>3.3 Track-overarching topics – students from different minor tracks collaborate to write a review</td></tr>
<tr><td rowspan="2">8 weeks</td><td rowspan="2">1.4 Brain, behaviour and movement

B-competence

C- and P-competence</td><td rowspan="2">2.4 Electives

B-competence

I-competence
SoPhia

C- and P-competence</td><td>A</td><td>Human intermediary metabolism</td><td rowspan="2">3.4 CORE of B-BMS

B-competence</td></tr>
<tr><td>B</td><td>Cell signalling</td></tr>
<tr><td rowspan="2">8 weeks</td><td rowspan="2">1.5 Human genetics, reproduction and prenatal development

B-competence

C- and P-competence

I-competence
Philosophy and ethics (SoPhiA)</td><td rowspan="2">2.5 Electives

B-competence

I-competence
Statistics

C- and P-competence
+Poster presentation</td><td>A</td><td>Biorhythms in homeostasis</td><td rowspan="3">3.5-3.6 Thesis

Application of
B-
C-
I-
And P- competences</td></tr>
<tr><td>B</td><td>Neuromuscular control of movement</td></tr>
<tr><td>4 weeks</td><td>1.6 Critical appraisal of a biomedical Publication

I-competence

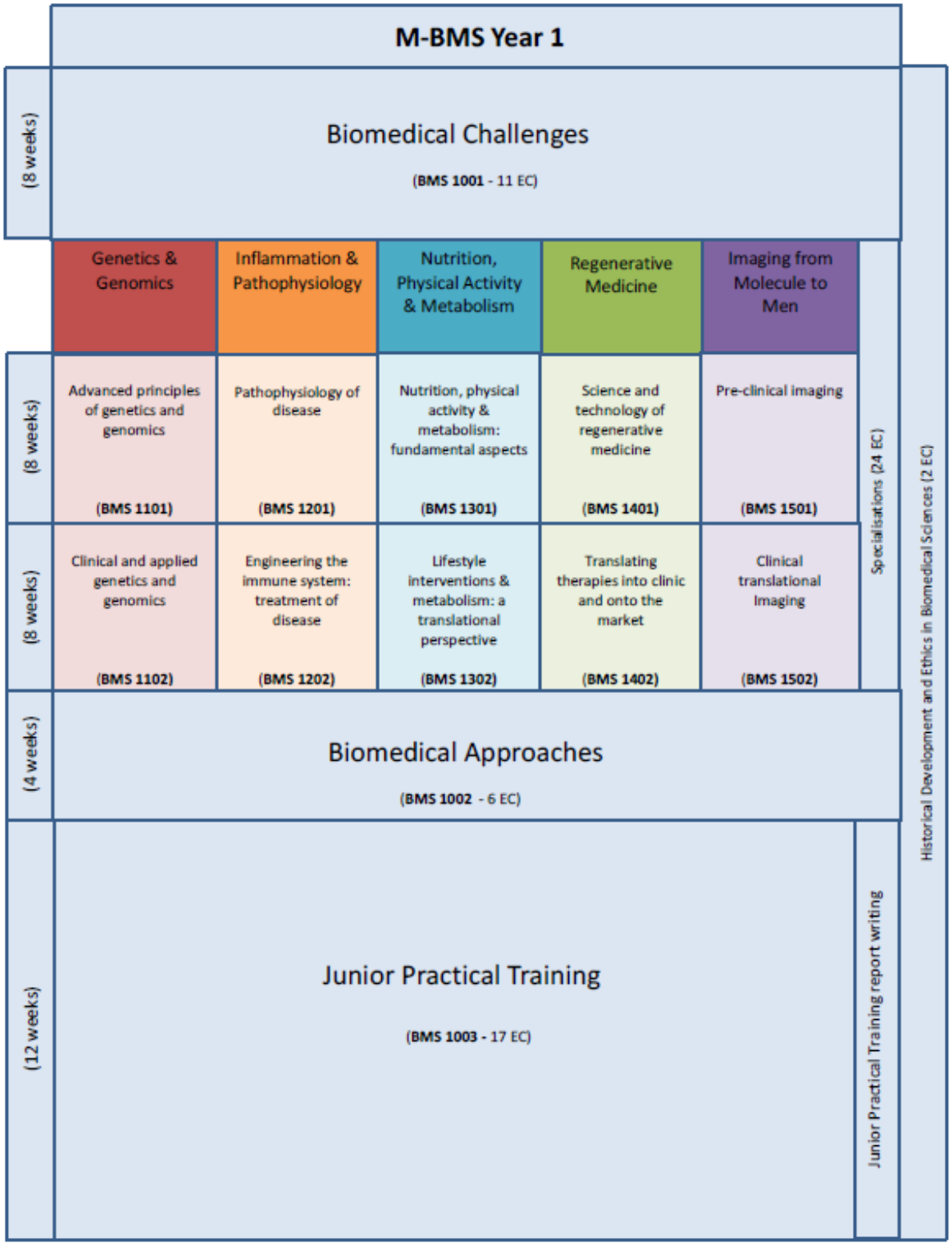
C- and P-competence
Lab skills (cumulative GLP exam year 1)</td><td>2.6 Electives

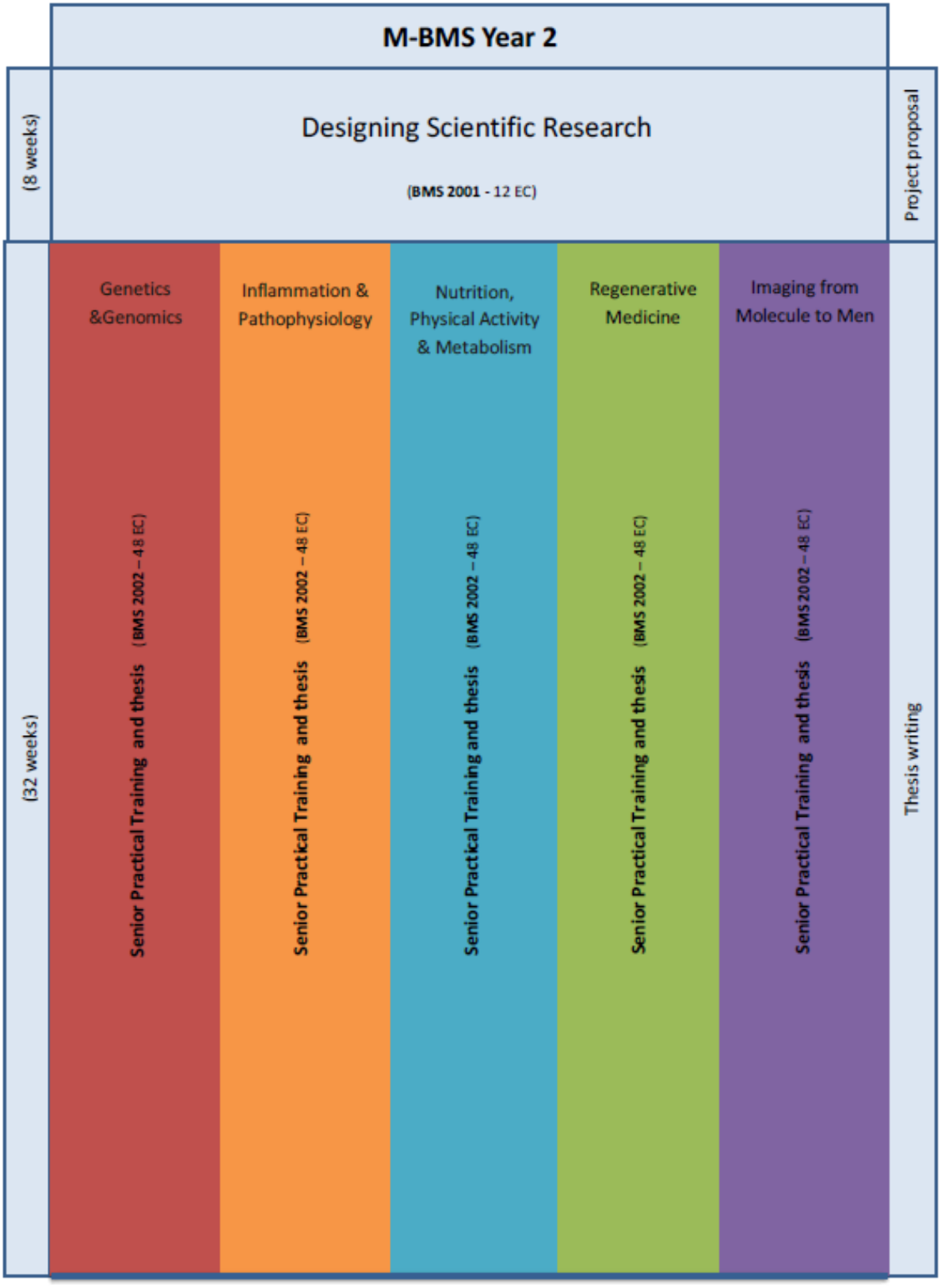
B-competence

I-competence
Statistics

C- and P-competence</td><td>A
B
C</td><td>Integrative systems biology
Allometry
Sensorimotor behaviour and neuroplasticity</td></tr>
</table>

Master's programme Biomedical Sciences




M-BMS Year 2
(8 weeks)
Designing Scientific Research
(BMS 2001 - 12 EC)
Project proposal
(32 weeks)
Genetics &Genomics
Inflammation & Pathophysiology
Nutrition, Physical Activity & Metabolism
Regenerative Medicine
Imaging from Molecule to Men
Senior Practical Training and thesis (BMS 2002 – 48 EC)
Senior Practical Training and thesis (BMS 2002 – 48 EC)
Senior Practical Training and thesis (BMS 2002 – 48 EC)
Senior Practical Training and thesis (BMS 2002 – 48 EC)
Senior Practical Training and thesis (BMS 2002 – 48 EC)
Thesis writing

APPENDIX 5: PROGRAMME OF THE SITE VISIT

Monday 29 January		
11.30	13.30	Arrival, lunch, preparing meetings, access to additional information
13.30	13.50	Presentation on B-BMS and M-BMS by Director of Education domain Biomedical Sciences
14.00	14.45	Meeting with Management BMS
14.45	15.30	Meeting with students BSc
15.30	16.15	Meeting with teaching staff BSc
16.15	16.30	Break
16.30	17.15	Meeting with students MSc
17.15	18.00	Meeting with teaching staff MSc
18.00	18.30	Meeting with Alumni BSc and MSc
19:30	-	Dinner, evaluation day 1/points of attention day 2

Tuesday 30 January		
8.45	9.30	Arrival panel, preparing meetings
9.30	10.15	Meeting with representatives Educational Programme Committee BSc and MSc 1. Chair (staff member 1) 2. Vice-chair (student 1) 3. Staff member 2 4. Staff member 3 5. Student 2 6. Student 3
10.15	11.00	Meeting with Board of Examiners Biomedical Sciences (BSc and MSc) 1. Chair Board of Examiners Biomedical Sciences 2. Vice-chair Board of Examiners Biomedical Sciences 3. member Board of Examiners Biomedical Sciences
11.00	11.45	Internal meeting panel / preparation concluding meeting with Management
11.45	12.15	Walking tour facilities
12.15	12.45	Lunch
12.45	13.30	Concluding meeting with Management
13.30	15.45	Preparation oral presentation
15.45	16.15	Oral presentation committee (incl. dean)
16.15	17.15	Reception

APPENDIX 6: THESES AND DOCUMENTS STUDIED BY THE PANEL

Prior to the site visit, the panel studied fifteen theses of the bachelor's programme Biomedical Sciences. In addition to these theses, additional assessment forms were studied by the panel.
Prior to the site visit, the panel also studied fifteen theses of the master's programme Biomedical Sciences.
Information on the selected theses and assessment forms are available from QANU upon request.

During the site visit, the panel studied, among other things, the following documents (partly as hard copies, partly via the institute's electronic learning environment): course manuals, annual reports by the Board of Exams, course evaluation results, and information on alumni.

The courses the panel reviewed in full detail were:

Bachelor's programme:
- Course 1.1 'The Lego Bricks of Life'
- Course 1.5 'Human Genetics, reproduction and prenatal development'
- Course 2.2 'From cradle to grave'

Master's programme
- Course 1001 'Biomedical Challenges'
- Course 1401 'S&T of regenerative medicine'
- Course 2001 'Designing scientific research'