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**Master Medical and Pharmaceutical
Drug Innovation
University of Groningen**

*Report of the limited programme assessment
4 December 2018*

Utrecht, The Netherlands
March 2019
www.AeQui.nl
Assessment Agency for Higher Education

Colophon

Programme

University of Groningen

Result of institutional assessment: positive

Programme: Master Medical and Pharmaceutical Drug Innovation

Study load: 120 EC

Location: Groningen

Mode of study: fulltime

Croho: 60617

Panel

prof. dr. A.F.P.M. (Anton) de Goeij, chair

prof. dr. V. (Veerle) Foulon, domain expert

prof. dr. P.M.L.A. (Patricia) van den Bemt, domain expert

dr. D.C. (Dik) van Gent, domain expert

L.M. (Lydia) Wolfs BSc, student

drs. L. (Linda) van der Grijspaarde, secretary

The panel was presented to the NVAO for approval.

The assessment was conducted under responsibility of AeQui VBI

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Summary

On 4 December 2018 an assessment committee of AeQui visited the Master's programme Medical and Pharmaceutical Drug Innovation at the University of Groningen. The assessment committee judges that each standard is of either satisfactory or good quality; the overall quality of the programme is **good**.

Request for a change of the programme's name

The programme requests for an assessment of an intended change of the name of the programme, from *Medical and Pharmaceutical Drug Innovation* to *Molecular Medicine and Innovative Treatment*. The main motivation of the programme for the change is that the current name does not cover the content of the programme. The assessment committee assessed the suitability of the new name by judging a written and oral explanation of the management of the programme. Based on this assessment, the committee awards the NVAO a positive recommendation for the new name.

Intended learning outcomes

The MSc programme has a clear and ambitious profile aiming to prepare talented students for a career in (bio)medical and pharmaceutical research. The six content-driven tracks allow students to specialize in their own field of interest. The programme offers a seventh track: International Master in Innovative Medicine (IMIM). This track is special as it represents an international track which is part of a double degree MSc programme jointly organized by the University of Groningen, Heidelberg University and Uppsala University. The programme translated its profile into eighteen final qualifications that are defined according to the Dublin descriptors. These intended learning outcomes are well described in terms of level and orientation and are in line with the domain-specific requirements for biomedical sciences. To reflect the profile of the programme even better, they could be translated from knowledge and skills items into integrated competences. The assessment committee qualifies the intended learning outcomes as **good**.

Teaching-learning environment

The two-year programme involves a total student workload of 120 ECTS. There is a strong focus on training academic research skills and students are

actively trained and guided to identify their own research interests and ambitions. The curriculum is designed in a very conducive manner to the achievement of the final qualifications. The programme provides extensive training of academic skills that are necessary to become a high-profile scientist in (bio)medical and/or pharmaceutical sciences. The tracks provide ample room for individual specialisation. The curriculum ties closely in with the qualifications of the incoming students and the selective character of the programme safeguards its high quality. Student cohorts are small, ensuring a highly interactive learning and tutoring environment with a great deal of attention for the student's individual needs, performance and development. The staff is highly qualified, enthusiastic and supportive for the students. The accommodation and material facilities (infrastructure) are sufficient for the realisation of the curriculum. Students have access to state-of-the-art research facilities. The assessment committee qualifies the teaching-learning environment as **good**.

Student assessment

In every course, students are assessed for their knowledge, research skills and general academic competences. Knowledge is assessed during exams for example via written reports. Research skills are typically evaluated by assignments such as the writing of reports and oral presentations, including the discussion of results. General competences including collaboration with peers, researchers and project management are evaluated by assignments. The latter is often linked to group assignments. The assessments are valid, reliable and sufficiently independent. The requirements are transparent to the students. The programme uses rubrics for most assessments to increase transparency in the learning outcomes, the expectations of students and the grading method. The quality of interim and final examinations is sufficiently safeguarded and meets the stat-

utory quality standards. The tests support the students' own learning processes. The assessment committee qualifies the student assessment as **satisfactory**.

Achieved learning outcomes

The programme judges the level of achievement by the final research projects performed in the course *Research project II*. The students reach a high level of achievement and are very well prepared for a career in (bio)medical and pharmaceutical research. The achievement of the intended learning outcomes is demonstrated by the results of the research project and the performance of graduates as PhD or researcher in a private sector environment. The assessment committee qualifies the achieved learning outcomes as **good**.

Recommendations

Although the overall quality of the programme is good, there is nonetheless room for improvement. In order to bring the programme to an even higher level of quality in the future, the committee issues the following recommendations:

All standards of the NVAO assessment framework are assessed positively; the assessment committee therefore awards a positive recommendation for the accreditation of the programme.

On behalf of the entire assessment committee,
Utrecht, March 2019,

prof. dr. Anton de Goeij
Chair

- incorporate some specific features of the seventh track IMIM in the other tracks, such as entrepreneurship and translational research (from Bench to Bedside and Back);
- translate the final qualifications from knowledge and skills items into integrated competences so they would better reflect the profile of the programme and the actual learning outcomes of the students;
- create learning lines throughout the curriculum to more clearly show the growth and development of the students;
- fine-tune the rubrics so that they match the learning outcomes even more and better reflect the growth in competences during the programme;
- reflect the differences between the two projects *Research Project I* and *Research Project II* in the requirements for the projects and in the assessment criteria.

drs. Linda van der Grijspaarde
Secretary

Introduction

This report describes the limited programme assessment of the master's programme Medical and Pharmaceutical Drug Innovation (MPDI) offered by the University of Groningen. The report also deals with the intended change of the name of the programme.

The institute

With about 30,000 students, the University of Groningen is one of the largest Dutch universities. The university employs approximately 6,000 people, of whom approximately 3,500 are academic staff. In 2018 the university has ten faculties in Groningen and one in Leeuwarden.

The University of Groningen chooses to offer educational programmes that stimulate general scientific education and create an environment that encourages lifelong learning. In addition, the university wants to stimulate students through the major-minor system to look beyond the limits of their own study.

The Master programme MPDI is a multidisciplinary interfaculty programme at the University of Groningen. It is embedded within the University Medical Center Groningen (UMCG) as well as the Groningen Research Institute of Pharmacy (GRIP). The UMCG is the primary stakeholder ('penvoerder') of the research institutes and the MPDI programme.

The programme is organized by the Graduate School of Medical Sciences (GSMS), which is part of the UMCG. The Graduate school is responsible for both master and PhD programmes. The mission of the Graduate school is to educate and train researchers of the future and to promote excellent research through the integration of teaching and research.

Research within the UMCG is embedded in five distinct research institutes:

- 1 Groningen University Institute for Drug Exploration (GUIDE)
- 2 Research Institute for Neurosciences of Healthy Ageing (BCN- BRAIN)

- 3 Cancer Research Center Groningen (CRCG)
- 4 WJ Kolff Institute for Biomedical Engineering and Materials Science (Kolff)
- 5 Sciences in Healthy Ageing and healthcaRE (SHARE)

GUIDE is an interfaculty research institute in which both the UMCG and GRIP participate. Research institutes collaborate in the GSMS to educate and train master and PhD students for future scientific leadership. The research institutes are responsible for all matters related to research quality and research policy and strategy.

The tracks of the programme are aligned with the research focus of the research institutes GUIDE, BCN-BRAIN and CRCG. The teachers and organizational staff are recruited from these research institutes and all students need to perform their research project under supervision of a staff member who is associated with one or two of these research institutes.

The programme

The Master degree programme MPDI is a two-year full-time master's programme, amounting to 120 ECTS.

The aim of the programme is to prepare talented students for a career in scientific research in the field of (bio)medical and pharmaceutical sciences in academic and private sector environments. Students follow a tailor-made programme and have the opportunity to specialize in a specific research field by participating in tracks.

Characteristic for the MPDI programme is that a substantial part of the students, after selection, are offered the possibility to actually carry out the research project during a three years' PhD fellowship, based on a proposal they produced within

the MPDI programme. This illustrates the intrinsic link between Master's and PhD education for those who are interested and able to take that final step in their educational trajectory.

The assessment

The University of Groningen assigned AeQui VBI to perform a quality assessment of its master's programme MPDI. Together with the quality assessment, the programme requested for an assessment of an intended change of the name of the programme.

The assessment is part of the Pharmacy assessment cluster, which also includes other bachelor and master programmes in the domain of Pharmacy offered by the University of Groningen, Leiden University and Utrecht University. AeQui convened an independent and competent assessment committee in cooperation with the programmes in the cluster. Partly because the majority of the committee members are present during the visitation of all the programmes in the cluster, coordination between the assessments in this cluster is guaranteed. On 5 November 2018 all committee members, director of AeQui drs. Lisa Janssen and secretary Linda van der Grijspaarde had a meeting to prepare for this cluster visitation.

A preparatory meeting with representatives of the programme was held to exchange information and plan the date and programme of the site-visit.

In the run-up to the site visit, the assessment committee has studied the self-evaluation report

on the programme and reviewed a sample of research projects accepted during the last two years. On 3 December 2018 the committee discussed the first findings in a preparatory meeting and formulated further questions for the visit. The site visit was carried out on 4 December according to the programme presented in attachment 2. During the site visit, the committee was provided with further information in various rounds of discussions and questions were raised and discussed. At the end of the discussions, the panel discussed the whole set of findings and considerations and translated them into preliminary conclusions. At the end of the visit, the chair of the assessment committee presented the initial findings of the committee to representatives of the programme and the institution.

In this document, the committee is reporting on its findings, considerations and conclusions according to the NVAO framework for a limited programme assessment. A draft version of the report was sent to the programme management; its reactions have led to this final version of the report.

The programme conducts a so-called development dialogue with the committee, discussing potential improvements from a development perspective. This dialogue will take place in March 2019. The results of this development dialogue do not affect the assessment presented in this report.

Request for a change of the programme's name

The programme requests for an assessment of an intended change of the name of the programme, from *Medical and Pharmaceutical Drug Innovation* to *Molecular Medicine and Innovative Treatment*. The main motivation of the programme for the change is that the current name does not cover the content of the programme. The assessment committee assessed the suitability of the new name by judging a written and oral explanation of the management of the programme. Based on this assessment, the committee awards the NVAO a positive recommendation for the new name.

Findings

In an additional document the programme management explains its motivations for the name change. The main motivation is that the current name does not cover the content of the programme since it is aimed at training scientific researchers within the (bio) medical and pharmaceutical field. Because of the current name with both *Pharmaceutical* and *Drug* in the title, there is too much emphasis on the pharmaceutical part.

The misconception is also apparent from the proportion of student applications with a pharmaceutical background (75%) compared to applications from students with a biomedical background (25%). The programme strives for a more balanced mix of intake and a new name can certainly contribute to this. In addition, an evaluation was conducted among lecturers and students, and more than 90% of the respondents indicated that they preferred a different name that would better cover the content of the programme.

According to the management, the term *Molecular Medicine* in the new name indicates that a wide range of medical biological research is covered in the programme. *Innovative treatment* in the new name shows that the emphasis is more on translational research where the developments of new treatment methods are covered more broadly than by *Drug Innovation*.

The new name also fits in well with the key priorities of the research policy of the UMCG as formulated in the Research Strategy, in which Mech-

anisms of diseases, Prevention and Innovative diagnostics and treatment are formulated as main areas of focus.

Similar programmes are called *Molecular mechanisms of disease* (Radboud University) and *Molecular medicine* (Erasmus University) and the new name is fitting within the field, according to the management. Furthermore, they state that the unique character of the education within this spectrum of programmes is the intensive cooperation between the UMCG and the pharmacy, which in their view is well represented by *Innovative treatment*.

The programme's content will not be adjusted on the basis of this name change and the new name fits in well with the current final objectives of the programme.

The proposed name change has been discussed with the programme committee and the Board of Examiners. In addition, the proposed change of name was also reported to the Executive Board of the University of Groningen by letter from the dean of the UMCG dd. July 12, 2018 and approved.

Considerations

Based on the interviews and examination of the underlying documentation, the assessment committee agrees with the intended new name *Molecular Medicine and Innovative Treatment*. This name fits the profile of the programme and covers the content of the current curriculum well.

1. Intended learning outcomes

The assessment committee qualifies the intended learning outcomes as **good**. The programme has a clear and ambitious profile aiming to prepare talented students for a career in (bio)medical and pharmaceutical research. The six content-driven tracks allow students to specialize in their own field of interest. The programme has translated its profile into eighteen final qualifications that are defined according to the Dublin descriptors. These intended learning outcomes are well described in terms of level and orientation and are in line with the domain-specific requirements for biomedical sciences. To reflect the profile of the programme even better, they could be translated from knowledge and skills items into integrated competences.

Findings

The programme aims to prepare talented students for an (international) career in (bio)medical and pharmaceutical research in an academic or in a private sector environment. An overview of the different research skills is listed below:

- critical reading and analysis of scientific literature (opposing views, writing a review report), scientific discussion, presentation skills, 'helicopter view' (writing an editorial), and attending scientific symposia;
- analyzing the quality of researchers and research groups (quality of output; H-factor, impact factor, fundraising potential, international networks), debating with experts and training in scientific integrity;
- formulation of a research hypothesis, design of an experimental approach and writing and defending a research proposal in a VENI-like procedure;
- performing laboratory experiments, analysis and interpretation of results, formulation of conclusions and placement of results.

The master programme was originally developed by members of the UMCG and GRIP, who can be viewed as potential future employers of the graduates. The programme reflects the research focus of the UMCG and GRIP. Therefore, the students receive a broad overview on the entire spectrum of (bio)medical and pharmaceutical sciences. In September 2016, track-specializations were introduced into the programme to allow students to specialize in their own field of interest. The tracks

are UMCG/GRIP-driven and cover the entire spectrum of molecular medicine and drug research, ranging from basic to translational and clinical research. Track-overarching keywords are healthy ageing and personalized medicine, two key priorities within the UMCG and GRIP. The tracks are:

- 1 Oncology
- 2 Infection and Immunity
- 3 Drug Innovation
- 4 Medical Systems Biology and Bioinformatics
- 5 Medical Nutrition and Metabolic Diseases
- 6 Medical Neurosciences and Neurological Diseases

The programme offers a seventh track: *International Master in Innovative Medicine (IMIM)*. This track is special as it represents an international track which is part of a double degree MSc programme jointly organized by the University of Groningen, Heidelberg University and Uppsala University. In contrast to the six content-driven tracks, students do need to register for the IMIM track during admission, mainly due to the unique international, multi-university dimensions of this track.

Students decide during the programme whether they will specialize in a particular area by choosing a track, or not. This option creates flexibility and allows students to optimally align and customize the programme to their personal preferences and research ambitions. According to the self-evaluation report, this is a unique strength as in most other master programmes students focus directly on a specific area either dictated by the

programme itself or by the necessity to choose a track at the start of the programme.

According to the self-evaluation report, another strength and novel feature of the programme is the integrated training in (bio)medical and pharmaceutical sciences as also is described in the domain specific framework of biomedical sciences. The long collaboration and close vicinity of GRIP to the UMCG has been instrumental in this design. Furthermore, in case of IMIM, the close collaboration of the University of Groningen, Heidelberg University and Uppsala University is unique and has a clear strength. The European Institute of Technology (EIT) label was awarded to IMIM given its unique Bench to Bedside and Back (BBB) learning line.

The programme has translated its profile into eighteen final qualifications. The final qualifications are defined according to the Dublin descriptors to meet the internationally accepted standards for master programmes. They comply with the requirement that the graduate has gained advanced knowledge, skills and general competences in the field of (bio)medical and pharmaceutical sciences.

Considerations

The committee established that the master programme offers the students the possibility to obtain a multidisciplinary overview on the fields of (bio)medical and pharmaceutical sciences. Students gain research skills that are important for a successful career in academia and private sector

environments. The committee observed that by distinguishing the master tracks, the programme makes a clear choice and focuses on biomedical research and development within the fields of expertise. By staying close to the expertise available within UMCG and GRIP, the programme ensures expert guidance and presence of state-of-the-art equipment. The committee suggests that some specific features of the seventh track IMIM could be incorporated in the other tracks, such as entrepreneurship and translational research (from Bench to Bedside and Back).

The profile is elaborated into final qualifications, structured by the Dublin descriptors. According to the committee, these intended learning outcomes are well described in terms of level and orientation and are in line with the domain-specific requirements for biomedical sciences. However, the intended learning outcomes do not explicitly reflect the orientation and the focus of the tracks of the programme. In addition, the committee advises to translate the final qualifications from knowledge and skills items into integrated competences. In that way these would better reflect the profile of the programme and the actual learning outcomes of the students.

Based on the interviews and examination of the underlying documentation, the assessment committee qualifies the intended learning outcomes as **good**.

2. Teaching-learning environment

The assessment committee qualifies the teaching-learning environment as **good**. The curriculum is designed in a very conducive manner to the achievement of the final qualifications. The programme provides extensive training of academic skills that are necessary to become a high-profile scientist in (bio)medical and/or pharmaceutical sciences. The tracks provide ample room for individual specialisation. Although the structure of the programme and the learning outcomes per course are clearly defined, it would be beneficial to create learning lines throughout the curriculum to more clearly support and reveal the growth and development of the students. The curriculum ties closely in with the qualifications of the incoming students and the selective character of the programme safeguards its high quality. Student cohorts are small, ensuring a highly interactive learning and tutoring environment with a great deal of attention for the student's individual needs, performance and development. The staff is highly qualified, enthusiastic and supportive for the students. The accommodation and material facilities (infrastructure) are sufficient for the realisation of the curriculum. Students have access to state-of-the-art research facilities.

Findings

Characteristics

Main characteristics of the programme are the focus on research, selectivity, multidisciplinary and learning by doing.

Focus on research and gateway for PhD

All programme courses are focusing on how to become a successful independent researcher. Directly from the start on students learn to become critical evaluators of current research, develop their own ideas and the kind of researcher they want to become. This is completed by the writing of their own independent research proposal for which they can obtain funding in a competitive way.

As a concluding assignment of the programme, students write their own PhD research proposal under supervision of a staff member of the UMCG or GRIP. These proposals are subject to evaluation procedures similar to 'real' grants (NWO VENI-like procedure). The students have the possibility to obtain a 3-year PhD scholarship to execute the project when the proposal is judged very good to excellent. The number of available UMCG and GRIP scholarships ranges between four to twelve per year over the last six years.

Selectivity and international character

The mission is to attract students for the programme who are passionate about science and have the capacity to become an excellent researcher. Recruitment occurs worldwide, safeguarding the international character of the programme. Prospective students will only be admitted to the programme after positive evaluation by the Admissions Board.

The international character is reflected in the different nationalities of the students. For example, the 2017-2018 first year cohort includes fourteen different nationalities. To further integrate the international perspective and pay explicit attention to internationalization in the programme, an innovation grant has been obtained by the programme. Initially, students and staff members were interviewed to identify the need and preferences of both parties. As a result, two workshops were developed for the students. During the first workshop, which is organized in the first week of the programme, the teaching styles in the programme are discussed to make students aware of the different learning and working styles students have. Furthermore, differences in cultural backgrounds among students are discussed, with the help of the cultural iceberg where students are

made aware of the fact that most aspects of a culture are below the surface, thus invisible. A follow-up meeting is organized after eight weeks, to discuss what kind of issues they faced during the start of the study programme and to provide tips and tools on how to handle these issues. The second workshop focuses on intercultural collaboration and discusses strategies to collaborate with people in an international context. Students are challenged to come up with their own ideas and strategies to overcome differences in for example working styles.

Multidisciplinarity

(Bio)medical and pharmaceutical research is becoming increasingly multidisciplinary. The focus in the programme is on elucidating the mechanisms of disease, the identification of new targets for therapies and prevention, and the development of drugs and diagnostics. The programme states that its multidisciplinary character is guaranteed by its embedding within the UMCG and GRIP. It is also mirrored in the educational background of the students: Life Sciences, Biology, Biotechnology, Medical Sciences, and Pharmaceutical Sciences.

Research-oriented Learning by Doing

All courses are research-oriented and taught in English by staff members of the UMCG and GRIP. Students have frequent interactions with staff members to enhance their academic skills but also to guide them in taking important decisions about their future career. Students will perform two major research projects (each with a minimum of 30 ECTS) under supervision of a researcher of the UMCG or GRIP.

To facilitate social interactions between students, students and teaching staff, as well as students and the Master office, a 'physical home' has been created over the summer of 2018 for all GSMS master students. In close vicinity to this place, a room has been made available where students can invite staff members for meetings or consultations. Furthermore, the Master office of the GSMS has been re-located to this area to

strengthen the contact with students. Next to the 'physical home' also a 'virtual home' is being developed for master students where they can share their experiences in different research disciplines and come into contact with prospective supervisors for new projects. This network will also include alumni of the GSMS master programmes.

Curriculum

The two-year MPDI MSc programme involves a total student workload of 120 ECTS. An overview of the programme of the MPDI and of the specific track IMIM is given in appendix 4. Both programmes are described below.

MPDI programme

Initially, the programme is highly structured with many contact moments with staff members to facilitate a steep learning curve. During the programme, the content and expectations of the assignments increase in complexity such that the students become increasingly more knowledgeable and skilled. There is a strong focus on training academic research skills and students are actively trained and guided to identify their own research interests and ambitions.

After their first experience of being a junior researcher, the students are specifically trained to formulate novel research hypotheses and learn how to develop research projects by themselves. This promotes their independence and the obtained knowledge and skills can be directly applied during their second internship; either at the UMCG/GRIP or at top-institutions around the world. At the end of the programme, the students write an individual competitive curiosity-driven PhD grant proposal after which the students are fully geared to start working in a professional research environment.

According to the self-evaluation report, the guidance and monitoring of the research projects are of great importance for success. To this end, students have to write an essay at the start of their research project, including the research design which they discuss with the supervisor. On top of

this, two meetings with the student, the supervisor and mentor are planned within the research project to discuss what goes well and what should be improved. Through these mid-term evaluations, the students know what is expected from them and which aspects of their performance require more attention. During these mid-term evaluations the students also meet with their mentor in private to allow students to speak freely about their challenges and worries.

The students can choose one of the six track-specializations or can decide to follow the general programme. For a track nomination, students must fulfil at least one research project and 10 ECTS on elective courses designated to that track. A track will be assigned to the diploma by the Board of Examiners only at the written request of a student. Students can request for a track nomination during the whole programme.

Given the importance of academic competencies in the research-oriented programme, the programme is currently developing a monitoring system based on results of exams, in combination with e-modules on transferable skills. The e-modules will comprise for example scientific reading and professional behaviour in an international environment. Some are integrated within existing courses, others function as stand-alone modules to which students have access throughout the programme. All e-modules will be linked to the assessment system of the programme and automatic reminders to follow these e-modules will be sent to a student who scores below average. Students can also monitor their individual development on specific learning outcomes and can see how they score compared to the rest of their cohort. The monitoring system and the e-modules are being developed by means of an educational innovation grant obtained from the University of Groningen.

In the student chapter of the self-evaluation report, the students give a positive reflection on the content and structure of the programme. They are satisfied with the opportunities to first gain

some practical skills and learn about the different lines of research within the university, before entering the different laboratories for their internships. The recently introduced tracks are seen as an improvement for the programme. Students have different opinions on the first course, *Topclass 1*. For some it was too long and passive, while others needed this time period to adapt to their new study programme, as MPDI students come from diverse cultural and academic backgrounds.

Some of the students are not satisfied with the last part of the programme, where all students have to compete with each other for a limited number of PhD positions. This may negatively influence the relationships built during the programme. As the available PhD positions are awarded only at the end of the second academic year, there is little time left to positively reinvest in these relationships. The students suggested to award the scholarships earlier in the programme. They do acknowledge, however, that the scientific world can be very difficult and, therefore, this competition could be representative of the future. Other students commented that they did not have any problem with the timing of this aspect of the programme and thought it would be difficult to change. They believe that, in general, all students are grateful for the opportunity to obtain a PhD position through this competition.

The students who spoke with the assessment committee were very positive about the programme as well. They highly appreciated the possibility to specialise in the programme and the high level of the inspirational education.

IMIM

The track IMIM is the seventh track which is part of a double degree MSc programme jointly organized by the University of Groningen, Heidelberg University and Uppsala University. The IMIM programme is implemented such that students fulfil the degree requirements of at least two of the partner University's master degree programmes. Students can attend the first study year at all

three institutions and can choose between the University of Groningen and the University of Uppsala for the second year of the programme. Students are obliged to select another University for their second year. Hence, MPDI students within the IMIM track will study at the University of Groningen for only one year. In addition to this international character, the IMIM track includes a total of 16 ECTS dedicated to translational research, entrepreneurship, innovation skills and competences, which is a unique feature of the IMIM track.

IMIM students who attend the first year of the MPDI programme will participate in the courses: *Mechanisms of disease and innovative therapies* (11 ECTS), *Experimental techniques in research* (9 ECTS) and *Research project I* (30 ECTS), which is similar for the MPDI students. Next to this, IMIM students follow two courses called *Bed to Bench and Back (BBB) 1* and *BBB2* (4 ECTS each) and participate in the *Spring school meeting* (2 ECTS).

In year two, IMIM students will, like MPDI students, start with an elective period (11 ECTS) and participate in the MPDI courses: *Design of research projects* (5 ECTS), *Research project II* (30 ECTS), and *Writing and defending your own PhD proposal* (8 ECTS). Next to this, IMIM students attend the *Industry Perspectives on Innovative Medicine (IPIM) summer school* (2 ECTS) and follow *BBB3* (4 ECTS).

Study progress

Students reported to the committee that they feel the programme is challenging, but that the study load is not too high. According to the self-evaluation report, especially the first part of the programme is considered challenging by the students. Students have difficulties in meeting the strict deadlines. At subsequent stages in the programme, students become more familiar with dealing with strict deadlines and consider the workload as normal.

Although the programme is demanding, the drop-out rate has become low and the vast majority of students complete the programme within the regular two years. In the last years, no students or one student per year stopped prematurely. In total, only 5 out of 118 students decided to stop with the programme and this was due to personal reasons. Two students did not graduate within two years.

Admissions and admission procedure

In recent years, an overall increase in the number of applicants and admitted students was seen. 107 students applied for the programme in 2017 and 110 in 2018. Respectively 22 and 28 were admitted. For IMIM the numbers are around 300 applicants and around 30 admissions per year. Most applicants are non-EU citizens. The large majority of these students can only follow the programme if they obtain a full scholarship or a scholarship from their home country (eg. CONACYT for Mexican students, Colfuturo for Colombian students). The number of available MPDI scholarships for excellent non-EU students varies each year between six and ten. The programme does not have a strict maximum number of students, but strives to keep the cohort small enough to ensure highly interactive classes with close contact between students and staff members.

In summary, admission requires a completed Bachelor degree in (bio)medical or pharmaceutical sciences, sufficient knowledge of the English language and in particular motivation and talent for research. Admission to the MPDI programme occurs in three steps:

- 1 The admissions office of the University of Groningen reviews whether the candidate meets the minimal requirements and informs the Admissions Board on the eligibility of the student.
- 2 The Admissions Board evaluates the candidate on the basis of the University diploma and transcripts, curriculum vitae, motivation letter and a letter from an academic referent and decides whether the candidate will be invited for a (Skype) interview.

- 3 The interview is structured as follows: the first ten minutes of the interview are used to discuss motivation, the student's aspirations, future ambitions and talent for research. Thereafter, the student presents a research project in eight minutes (most students discuss their BSc project). Finally, the student is asked to give a journal club presentation of eight minutes. The candidate can choose from four distinct papers each corresponding to a different field of research. Each aspect of the interview is graded by the Admissions Board and students that receive an end grade higher than 8 will be admitted to the programme. Students with grades ranging from 7 to 8 will be thoroughly discussed by the Admissions Board regarding a positive or negative admission and students with grades lower than 7 will be declined. The selected candidates receive the details regarding the interview one week in advance.

Students and alumni reported to the committee that the admission procedure was of good quality and was useful. The students reasoned that the admission procedure ensured that all enrolled students were very motivated to study the programme.

Staff

Many UMCG/GRIP staff members are involved in the programme. The teaching staff consists of Principal Investigators (PI's) and senior staff members who participate in the research institutes GUIDE, CRCG and BCN-BRAIN. PI's are active researchers with more than a three-year track record on a clearly identified research theme on which they have regularly published (\geq eight in the last three years) in highly ranked journals (top 25%) in the relevant field.

All teachers have a PhD degree and are active and established scientists in their field of research. Teachers must be tenured or enrolled within the tenure track system of the UMCG/GRIP at the level of assistant professor, associate professor or full professor and should have successfully

guided PhD students as promotor or co-promotor. During the research project, the senior supervisor must be a PI, whereas the daily supervisor can be an advanced PhD student or someone who already obtained a PhD degree. Also, within the course *Writing and defending your own PhD research proposal* the supervisor must fulfil the requirements of being a PI. A mentor should have at least four years of post-doc experience. Currently, 85 % of the teaching staff have their University Teaching Qualification (UTQ; basis kwalificatie onderwijs) and 5 % is in training to receive the UTQ certificate.

The assessment committee discussed the training of staff in intercultural communication with the management of the programme. The management described there are several courses on this topic for staff members, offered by the University of Groningen. These courses are not compulsory and the management is not satisfied with the degree of participation. They are planning the development of an e-module (the International Teacher Platform) in 2019 to create more awareness and to provide practical tools for internationalization in the classroom, such as making use of Non-Western articles and how to create international learning outcomes.

In general, the students who spoke with the assessment committee were satisfied with the quality of the staff members. Some foreign students expressed that some teachers could be very direct and that they had difficulties adapting to this communication style in the beginning. This is confirmed by the reflection in the student chapter. The students appreciate the lack of hierarchy between students and professors, and stated that all staff members are easy to approach. The alumni also stated that one of the major strengths of the programme is the personal one-on-one contact with the teachers.

Facilities, provision of information and tutoring
Students have access to research facilities of the UMCG and GRIP. They are able to use for example

the flow cytometry unit, the imaging center, the proteomic facilities, etcetera.

At the beginning of the curriculum students receive an information package by the programme coordinator, both orally and via the Blackboard system. Throughout the year, the programme coordinator and the GSMS master office are available for all kinds of questions regarding the programme. The programme coordinator who also acts as student advisor, advises students regarding study matters.

To facilitate a close interaction between the programme coordinator, the GSMS master office and the students, the programme opened a 'social' room next to the offices of the GSMS master office. The international office deals with questions related to visa, immigration and housing but can also be contacted for help with medical insurances, finances, and facilities and official authorities within the city.

Second year students act as buddies for first year students to help them with various questions (e.g. housing, how to get around in Groningen but also for questions related to the programme, such as the use of Nestor) before the students start the MPDI programme and throughout the first semester.

Until September 2018, students were assigned to a mentor at the start of their first research project. Students had two meetings per year with their mentor: two and four months after the start of the research project. Based on student evaluations and the increased flexibility in the programme, the programme decided to intensify the mentoring of students since September 2018. A mentor is now assigned to the students at the start of the programme, whom they will meet four times in the first year and three times in the second year. The first two meetings in the first year and the first meeting of the second year are group meetings so students can also learn from each other; the other meetings are on an individual basis. These meetings are confidential and a mentor can only

consult the programme management after approval from the student involved.

The mentor is an advanced researcher with a minimum of four years of post-doc experience who guides a group of four to six students. During these meetings emphasis is placed on 1) study progress and reflection, 2) individual learning goals and research interests, 3) guidance in choosing electives and research internships, 4) career perspectives. Students can also approach their mentor outside the scheduled meetings. Next to the mentor, students can actively seek help from the track coordinators regarding research-specific questions.

Considerations

The committee has established that the contents of the curriculum enable students to achieve the final qualifications. The master programme provides extensive training of academic skills that are necessary to become a high-profile scientist in (bio)medical and/or pharmaceutical sciences. The assessment committee is of the opinion that the continuous lines of competence development in the programme could be strengthened. Although the structure of the programme and the learning outcomes per course are clearly defined, it would be beneficial to create learning lines throughout the curriculum to more clearly show the growth and development of the students. Furthermore, the first course should be more tailored to the competences of the students at the start of the curriculum, because their entrance levels and needs for adaptation to the Dutch education system are different.

The assessment committee studied the six tracks of the programme and concludes they provide ample room for individual choices and thereby give opportunities for deep learning. The seventh track IMIM with its focus on entrepreneurship and translational research provides added value to the other tracks. Students broaden their experiences and perspectives by learning and working at different universities.

The committee feels the teaching-learning concept of the programme structures the programme and is supportive for the learning process of the students. The educational formats are adequate. For example, students use presentation and writing assignments to develop their competences in communication. The committee appreciates the format of writing a grant proposal for a PhD position. A strong feature of the programme is its small scale which stimulates collaboration and provides ample opportunities for feedback between students and staff.

According to the assessment committee, the curriculum ties in closely with the qualifications of the incoming students. The selective character of the programme safeguards the high quality of the programme. Furthermore, it leads to a motivated, ambitious and talented cohort of students. The programme brings together students with a large number of different nationalities and a focus on intercultural collaboration thereby ensuring a genuine 'international classroom'. The assessment committee feels that the admission procedure functions well and is informative for students and the management.

The structure of the curriculum encourages study and enables students to achieve the final qualifications. Student cohorts are small, ensuring a highly interactive learning and tutoring environment with a great deal of attention for the student's individual needs, performance and development.

The assessment committee observes that the staff team is highly qualified for the realisation of the curriculum in terms of content and educational expertise. They are very motivated to work with this specific group of students. The students have ample personal contacts with the teaching staff,

who are easily accessible. They are qualified researchers and recognized within the (bio)medical and pharmaceutical sciences. Therefore, the programme is highly integrated with the future workplace of students. The student:staff ratio is good. The assessment committee suggests a strengthening in the training of staff in intercultural competences, which is planned by the programme to be developed.

The infrastructure, such as accommodation and material facilities, is sufficient for the realisation of the curriculum. Students have access to state-of-the-art research facilities.

The tutoring of and provision of information to students are conducive to study progress and tie in with the needs of the (international) students. The assessment committee is enthusiastic about the strong monitoring system based on results of exams, in combination with e-modules on transferable skills. The programme has an active mentoring and guidance system.

Based on the interviews and examination of the underlying documentation, the assessment committee determines that the curriculum is designed in a very conducive manner to the achievement of the final qualifications. The curriculum ties in closely with the qualifications of the incoming students and the selective character of the programme safeguards its high quality. The staff is highly qualified, enthusiastic and supportive for the students. The management and teaching staff are able and willing to continuously improve the programme using feedback from various stakeholders. Therefore, the assessment committee qualifies this standard as **good**.

3. Student assessment

The assessment committee qualifies the student assessment as **satisfactory**. The student assessments assess the students' knowledge, research skills and general academic competences. The assessments are valid, reliable and sufficiently independent. The requirements are transparent to the students. The programme uses Rubrics for most assessments to increase transparency in the learning outcomes, the expectations of students and the grading method. A further fine-tune of the rubrics is necessary so that they match the learning outcomes even more and better reflect the growth in competences during the programme. 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

Assessment system

In every course, students are assessed for their knowledge, research skills and general academic competences. Knowledge is assessed during exams for example via written reports. Research skills are typically evaluated by assignments such as the writing of reports and oral presentations, including the discussion of results. General competences including collaboration with peers, researchers and project management are evaluated by assignments. The latter is often linked to group assignments. The purpose of the group assignments is to stimulate students to thoroughly discuss the research question and train management skills in terms of working in a team, decision making, project management, and delegation of tasks. Most course units have learning outcomes related to knowledge, academic skills and general competences and, as a consequence, multiple types of assessment are used within one course. The combination of assessment types leads to the final grade. Mock exams are available.

Most assignments are evaluated using rubrics. A rubric for assessment, in the form of a matrix, is a tool used to interpret and grade students' work against criteria and standards. The programme states that the advantage of rubrics is that the learning outcomes are clearly defined and that the students know what is expected. Next to this, rubrics provide direct feedback to the students.

Also, the use of rubrics will likely enhance coherence in the grading by different teachers. The rubrics function as a guideline for grading but teachers can deviate from the rubric score on the basis of additional feedback. On top of this, individual feedback is mandatory when the grade is lower than 8. The rubric forms are made available to the students at the start of the course.

Written reports are assessed by two UMCG/GRIP senior staff members. The final grade is the average value of the two assessors. In case the end grade equals or is more than 2.0 values distinct between the assessors, the programme asks the assessors to re-visit their grading and discuss the outcome with each other. In the situation that both assessors maintain their original grades, the examiner assigns a third assessor. Then, for the final grade, the grade of the first two assessors is averaged and the grade of the third assessor counts as the second grade. All written reports are screened for plagiarism.

The assessment committee discussed the quality of the assessment and feedback by supervisors of internships abroad. The Board of Examiners explained that the supervisor abroad is not a formal examiner. The first examiner is always a staff member of the programme who gets informed by the supervisor. The mentor of the student has skype contact with the student after two and four months.

In the student chapter the students describe that they highly appreciate the assignments provided by the diverse courses, 'as they were continuously challenged and got the opportunity to improve themselves and learn from their mistakes'.

Quality assurance

The examinations for each unit are described in the Teaching and Examination Regulations. The assessment plan, drafted by the programme management and confirmed by the Faculty Board, details the assessment types and how they are related to the learning outcomes. The assessment plan is in accordance with the assessment memo of the Faculty of Medical Sciences, which is based on the general assessment policy of the University of Groningen ('UG Assessment Policy and Assessment. Aiming for Quality and Study Progress', 2014).

The Board of Examiners is responsible for the quality assurance of the examinations. The Board of Examiners advises the Faculty Board and the programme management on the Teaching and Examination Regulations and the assessment plan. The Board of Examiners makes explicit how it fulfils its tasks and obligations in the Rules and Regulations. Next to this, the Board of Examiners safeguards that each individual student meets the requirements with regard to knowledge, understanding and skills that must be fulfilled to be awarded the master's degree. Furthermore, the Board of Examiners monitors compliance with the Teaching and Examination Regulations. The Board of Examiners monitors the quality of the course assessments by evaluating a targeted sample of end-products within the curriculum. A targeted sample of reports of *Research project II* is evaluated annually. Examiners are appointed by the Board of Examiners who in turn are appointed by the Faculty Board. All examiners are instructed on the standards for examination by the programme management.

Considerations

The committee has established that the master programme has adequate assessment systems and assessment procedures. The assessment procedures are sufficiently implemented in the programme. Multiple assessment types are implemented in the programme and these are aligned with the learning outcomes. The assessments are planned in such a way that students have sufficient time to prepare.

The assessment committee is positive about the introduction of the use of rubrics to increase transparency in the learning outcomes, the expectations of students and the grading method. The committee agrees with the programme that a further fine-tuning of the rubrics is necessary so that they match the learning outcomes even more and better reflect the growth in competences during the programme. The committee advises to improve the use of rubrics by adding more personal feedback and substantiation of the judgment. This should be implemented for higher grades (>8.0) as well to facilitate a steep learning curve for all students and to clarify what was especially good in the student product.

The Board of Examiners performs thoroughly and pro-actively its tasks to control the quality of the exams, the assessment procedures and graduation research projects. The Board shows good knowledge of the programme and its assessment.

Based on the interviews and examination of the underlying documentation, the assessment committee qualifies this standard as **satisfactory**.

4. Achieved learning outcomes

The assessment committee qualifies the achieved learning outcomes as **good**. The students reach a high level of achievement and are very well prepared for a career in (bio)medical and pharmaceutical research. The achievement of the intended learning outcomes is demonstrated by the results of the research projects and the performance of graduates as PhD or researcher in a private sector environment.

Findings

The programme judges the level of achievement by the final research projects performed in the course *Research project II*. The outline of this project is similar to *Research project I*, including the writing of an essay (*Introduction to research project II*, 2 ECTS) preceding implementation of the actual research project (*Research project II*, 30 ECTS). The procedures and assessment criteria are identical to those in year 1 as well.

Students are strongly encouraged to go abroad for this internship, in which case a researcher from UMCG/GRIP will act as the examiner to guarantee the quality of supervision and assessment. Students are asked to identify a staff member who matches the expertise of the external host lab, and they need to ask approval from the track coordinators. The student has to update the UMCG/GRIP supervisor at least once every two weeks on the research progress. For grading, the staff member of UMCG/GRIP is guided by the senior supervisor of the external host laboratory. An independent staff member of UMCG/GRIP will act as the second evaluator. All students are graded individually. The final grade is determined on the basis of (0.5)* research skills + (0.40)* average grade written report + (0.1)* average grade presentation/discussion end symposium.

Students who decide to go abroad can apply for a GSMS scholarship of €500 to cover some of the expenses. Students have the possibility to extend *research project II* with 5 ECTS or can choose for an elective course.

The different assignments in *Topclass V: Writing and defending your own PhD research proposal*

are a tender, proposal, rebuttal, presentation and a defense. They are seen as an assessment to judge the level of achievements and serve as a preparation for a possible continuation of doing research with a PhD project.

In 2012-2018, 56 PhD projects were awarded to MPDI graduates. MPDI graduates receive three-year positions to execute their grant proposal. Furthermore, seventeen students successfully applied for a PhD position outside the UMCG/GRIP. In total, 62% of the MPDI graduates continued as a PhD student. The other 38% obtained positions in science and industry, continued studying or is still looking for a PhD position (2016-2018 cohort). The assessment committee asked the management how they keep track of the one third of the students that does not continue as a PhD student. The management explained that they think they should increase the possibilities to keep track of these students. Also, more attention should be given to other options after graduation. The programme already offers several workshops on career perspectives, but construction of an extra module related to career perspectives is considered.

Students get acquainted with their career options via participation in the *Welcoming Symposium* where MPDI graduates share their experiences during and after the MPDI programme and using the *Symposium Outside Academia*. Furthermore, several workshops on career perspectives are offered to the students throughout the programme. These include for example *Get insight in your personality: Do I want to do a PhD?* and *How to successfully network*.

The assessment committee discussed the large number of cum laude graduates with the Board of Examiners. The Board of Examiners explained that the requirements for cum laude are strict, and the number of students granted with cum laude fluctuates over the years. The Board is of the opinion that they are correctly awarded and reflect the high quality of this selected group of students.

Considerations

The committee assessed fifteen recent master research projects of the programme (appendix 5) and established that fourteen of the fifteen research projects met the requirements for graduation. These outcomes illustrate that the students have achieved the final qualifications as formulated by the programme. The research projects are graded similarly by the assessment committee compared to the programme. On average the research projects are of high quality. The high quality of the projects is reflected in the relatively high grades and in the fact that many students were able to publish the results obtained in the research projects in internationally peer-reviewed scientific top journals.

One project did not meet the requirements. The committee agreed with the second examiner, who graded the work with a 5. The assessment committee discussed this issue with the Board of Examiners. The Board was aware of the poor quality of this thesis. The assessment committee has been assured that the regulations have changed, so an extra examination will be carried out when one of the examiners states that the work is insufficient. The committee is convinced of the effectiveness of this approach.

The quality of the written feedback on the reports on the assessment forms is good. However, the committee strongly recommends that personal feedback and substantiation of the judgment is

necessary for higher grades (>8,0) as well, as already stated in standard 3.

The committee is positive about how the final grade is determined on the basis of the research skills, the written report and the presentation. The committee noticed that the grades for the research skills, based on experimental work, are high for most students. According to the committee it is necessary to substantiate and explain these high grades more, so it becomes clear how independent the student has worked, for example.

The committee established that the research projects of *Research Project I* and *Research Project II* do not differ much in nature. The committee advises to reflect the differences between the two projects in the requirements for the projects and in the assessment criteria.

Approximately, one-third of the students does not continue as a PhD student. Therefore, more attention should be given to other possibilities after graduation. The committee agrees with the programme that the setup of a module related to career perspectives would be a good idea. Also, the committee welcomes the initiative of the programme to create an alumni network and let young graduates benefit from the experiences of graduates who for example already obtained their PhD degree.

Based on the interviews and examination of the research projects, the assessment committee determines that the students reach a high level of achievement and are well prepared for a career in (bio)medical and pharmaceutical research in an academic or in a private sector environment. Therefore, the assessment committee qualifies this standard as **good**.

Attachments

Attachment 1 Assessment committee

em. prof. dr. Anton (Ton) F.P.M. de Goeij	Ton de Goeij is emeritus-hoogleraar aan de Universiteit Maastricht en in 2012 benoemd tot hoogleraar Curriculum Development. In 2011 ontving hij de Award for Education van de Faculteit Health Medicine & Life Sciences (UM). Tot 2014 was hij opleidingsdirecteur van de vier medische opleidingen van deze faculteit. Hij is daarnaast ruim 25 jaar internationaal adviseur curriculum development in o.a. Duitsland, Zwitserland, Egypte, El Salvador, Zuid-Afrika, Brazilië, USA, Verenigd Koninkrijk, Ierland, Indonesië en Saudi-Arabië. Ton was tot en met 2016 visiting professor aan Hull York Medical School. Ton de Goeij was voorzitter en lid van verschillende visitatiecommissies: Master Oncology (VU Amsterdam, 2012 en 2017), Bachelor en Master Medical Technology (UTwente, 2013), Bachelor en Master Biomedical Sciences (VU Amsterdam, 2017), Bachelor and Master Geneeskunde (Radboud Universiteit Nijmegen en ULeiden, 2017).
prof. dr. V. (Veerle) Foulon	Veerle Foulon is hoogleraar Klinische Farmacologie en Farmacotherapie aan KU Leuven. Zij is vice-decaan van het faculteitsbestuur Farmaceutische Wetenschappen, lid van de Faculteitsraad en POC van Farmaceutische Wetenschappen en lid van de Departementsraad Farmaceutische en farmacologische Wetenschappen. Zij is voormalig lid van het bestuur van PCNE (Pharmaceutical Care Network Europe). Veerle Foulon publiceert en verzorgt onderwijs farmacotherapie, zelfzorgadvies en patiëntgerichte zorg in de bachelor en master. Zij coördineert de masterproef en is betrokken bij navorming voor apothekers.
prof. dr. P.M.L.A. (Patricia) van den Bemt	Patricia van den Bemt is ziekenhuisapotheker en klinisch farmacoloog. Zij is bijzonder hoogleraar medicatieveiligheid aan Erasmus MC en begeleidt als promotor en co-promotor veel onderzoekstrajecten. Ook is zij verantwoordelijk voor meerdere onderzoeken op basis van tweede geldstroom, waaronder meerdere ZonMw beurzen. Zij publiceert en is betrokken bij het onderwijs (BKO gecertificeerd) binnen Erasmus MC op het gebied van medicatieveiligheid. Daarnaast is zij actief in meerdere (internationale) commissies voor overheidsinstanties en in de industrie.
dr. D.C. (Dik) van Gent	Dik van Gent is Associate professor en opleidingsdirecteur van de MSc research master Molecular Science bij Erasmus MC. Hij geeft les aan PhD cursussen en andere MSc programma's. Hij is o.a. lid van de Commissie Toetsbeleid.
Lydia Wolfs, BSc, student-lid	Lydia Wolfs heeft in 2016 haar Bachelor Psychobiology behaald en is sinds september 2016 masterstudent aan de VU Master Management, Policy Analysis and Entrepreneurship in the Life and Health Sciences. Naast haar opleiding is zij sinds maart 2018 parttime werkzaam in de healthcare administration (oa DBC's) op de financiële afdeling van het OLVG-ziekenhuis te Amsterdam. Tijdens haar studie heeft zij ervaring opgedaan in het opzetten en runnen van een eigen business. In de master was zij deelnemer aan het Indian Youth Parliament Pune, India, waar zij moderator en facilitator was van o.a. focusgroepen Indiase studenten.

Attachment 2 Programme of the assessment

4 december 2018

9.00-10.00	Committee preparation
10.00-10.45	MPDI programme management
10.45-11.15	Showcase
11.30-12.00	Board of Examiners
12.00-13.00	Lunch
13.00-13.45	Teaching staff
14.00-14.45	Students
15.00-15.45	Alumni
16.00-16.30	MPDI Programme Management (second meeting)
16.30-17.30	Committee preparation interim report
17.30-18.00	Oral report

Attachment 3 Final qualifications

Students have acquired knowledge and understanding of:

- 1 Disease mechanisms covered by one or more of the research programmes of the research institutes of the UMCG and GRIP.
- 2 Fundamental concepts of cell cycle regulation and cell proliferation, cell death and survival pathways, cell polarity, cellular signalling, immunology, macromolecule trafficking, membrane and organelle function, (advanced) genetics and genomics, stem cell biology, receptor pharmacology, drug delivery and targeting.
- 3 Important modern techniques such as macromolecule separation and analysis (biomarkers), genomics & proteomics, bioinformatics, gene transfer, advanced animal models (transgene and knock-out), advanced molecular imaging (optical imaging, in vivo imaging)
- 4 Evaluation methods, patent application and grant systems.

Students have obtained the ability to:

- 5 Conduct and design scientific research in areas of medical and pharmaceutical drug innovation that are relevant to the advancement of knowledge and insights into fundamental and applied aspects of health and disease.
- 6 Design and execute experiments and interpret data, addressing problems in medical and pharmaceutical research.
- 7 Translate a clinical or health-relevant problem or question into a rationally designed experiment to meet desired needs.
- 8 Critically judge and evaluate existing knowledge and insights.
- 9 Actively participate in a research group, including the academic debate.

Students have gained:

- 10 An awareness of potential societal and ethical implications of scientific research in medical and pharmaceutical drug innovation and, in this context, an ability to critically evaluate the effects of their research.
- 11 The capacity to communicate effectively in written and verbal form to other researchers in the field and to lay persons.

Students have demonstrated the ability to:

- 12 Collaborate in an interdisciplinary setting, i.e. clinicians, biological/biomedical and pharmaceutical researchers.
- 13 Critically review international scientific research.
- 14 Develop new concepts within the field of medical and pharmaceutical drug research and to translate these into novel intervention strategies.
- 15 Translate academic findings into innovative drugs using entrepreneurial approaches.
- 16 Have an understanding of the requirements for a successful scientific career and the ability to judge whether they fulfil these requirements.
- 17 Recognize the need for, and an ability to engage in ongoing learning and development.
- 18 Have the capability of designing, presenting and defending their own research projects.

Attachment 4 Overview of the programme

MPDI programme year 1

COURSE	CREDITS (ECTS)
Topclass I: Mechanisms of disease and innovative therapies	11
Topclass II: Experimental techniques in research	9
Topclass III: Fit for Practice	3
Introduction to Research Project I	2
Research Project I	30
Extension research project I or Elective course (e.g. Capita selecta)	5

MPDI programme year 2

COURSE	CREDITS (ECTS)
Elective courses (e.g. Capita selecta)	10
Topclass IV: Design of research projects	5
Introduction to research project II	2
Research Project II	30
Extension research project II or Elective course (e.g. Capita selecta)	5
Topclass V: Writing and defending your own PhD proposal	8

IMIM programme year 1

COURSE	CREDITS (ECTS)
Topclass I: Mechanisms of disease and innovative therapies	11
Topclass II: Experimental techniques in research	9
Bench-to-Bedside-and-Back I: Introduction into translational research groups*	4

Spring school: Personal development & leadership; industry and SME introduction*	2
Research Project I	30
Bench-to-Bedside-and-Back II: (societal) need identification for translational research*	4

Legend * IMIM-specific

IMIM programme year 2

COURSE	CREDITS (ECTS)
Summerschool: Industrial perspectives in innovative medicine*	2
Elective courses (e.g. Capita selecta)	11
Bench-to-Bedside-and-Back III: Entrepreneurship, venture lab & business plan*	4
Topclass IV: Design of research projects	5
Research Project II	30
Topclass V: Writing and defending your own PhD proposal	8

Legend * IMIM-specific

Attachment 5 Documents

- Self-evaluation Report 2018 MPDI
- Research Projects I en II: Students' guide and Supervisors' guide
- Documentation Opleidingscommissie
- Annual Report Board of Examinors MPDI/Clinical and Psychosocial Epidemiology UMCG
- Assessment Plan MPDI
- Graduation Projects of fifteen students