Research-intensive education
a common educational basis for the
Master’s programmes of the Utrecht University,
Graduate School of Life Sciences
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The training plan was drawn up by the Life Sciences Project team of the Utrecht University, Graduate School of Life Sciences. A great deal of care has gone into the texts. Nevertheless, they may contain imperfections. All rights are therefore reserved.

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Summary

This publication describes the curriculum and training provided by Utrecht University, Graduate School of Life Sciences (GS-LS). It focuses primarily on the curriculum in the Master's phase of the research programmes. In 2009 a Dutch version was published and this version will be updated where necessary.

The GS-LS combines all life sciences master's programmes of Utrecht University. The GS-LS aims to be more than the sum of a number of programmes plus a shared administration. The added value of the GS-LS is demonstrated by a shared mission, a strategy to implement that mission, a common educational philosophy and a consistent policy approach in areas where collaboration is needed to move forward. This document demonstrates that the GS-LS is on the way to becoming a successful Graduate School with a leading international position.

Chapter 1 sets out what the GS-LS stands for, gives a brief sketch of the academic and social context of the curriculum at the school and describes the relationship between the various inter-disciplinary and international research programmes at the School, as well as the focus areas defined by Utrecht University.

Chapter 2 provides a brief description of each Master's programme at the GS-LS.

Chapter 3 describes the GS-LS as one of the six Graduate Schools of Utrecht University and provides a broad sketch of the administrative structure of the school in terms of the responsibilities and competencies of the Board of Studies, Educational Committee, Board of Admissions, etc. The GS-LS is a matrix organisation that answers to the deans of Utrecht Life Sciences. Direction comes from a Board of Studies on which all the respective faculties are represented. The members, tasks and responsibilities of the administrative bodies are described.

Chapter 4 looks in detail at the curriculum as the core activity of the school. The general qualification targets for the Life Sciences Master's degrees are described, as they apply to all the GS-LS Master's programmes. This chapter also discusses the school's educational philosophy, 'Research-Intensive Education' and sketches the broad outlines of the programme structures.

Chapter 5 describes in more detail how the school operates at present.

• Section 5.1 takes a general look at how various processes at the school are coordinated.
• Section 5.2 relates in broad terms what is being done on the internationalisation front.
• Section 5.3 discusses the policy in the field of information and communications.
• Section 5.4 describes the policy relating to application, admissions and enrolment.
• Section 5.5 provides a description and analysis of the curriculum at the GS-LS. The school's mission means that its core task is to train researchers and so the educational learning process and didactic approach are tailored closely to achieving this goal. The didactic concept of 'Research-Intensive Education' was developed with this in mind and this section states how the curriculum at the school is designed using this concept as a framework.
• Section 5.6 looks at the school's arrangements for academic counselling and monitoring.
• Section 5.7 sets out the underlying principles and working methods for quality control at the school.
• Finally, section 5.8 describes how the Graduate School of Life Sciences works to establish links with the labour market in the light of the idea that we should be training researchers whose added value also qualifies them for jobs that are not strictly research-related.
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Chapter 1. 
Mission of the Utrecht University, Graduate School of Life Sciences

1.1 Life Sciences
The 21st century could be described as the century of the Life Sciences: research is unravelling the great questions about life, health, disease and development. New, fundamental insights will lead to new clinical research and treatments, new medicines, and new policy in the field of nutrition and health. Utrecht University wishes to maintain its position as a leading European research university and so it established six Graduate Schools in 2005, including the Utrecht University, Graduate School of Life Sciences (GS-LS). This school brings together all the training in the Master and PhD research programmes in Life Sciences at Utrecht University.

1.2 Interdisciplinary research and training
Research at the GS-LS is highly interdisciplinary. Breakthroughs are taking place where physics and medicine, and chemistry and biology interact. A traditional faculty structure with classic mono-disciplinary degrees such as biology, chemistry and medicine is no longer appropriate. The GS-LS aims to train Master’s and PhD students so that they can engage in independent research in a multidisciplinary setting. So the GS-LS brings together the research expertise and facilities of the faculties of Medicine, Veterinary Medicine and Science for this purpose. The School has been structured along the lines of thematic, interdisciplinary programmes that correspond to the focus areas adopted by Utrecht University in this area. These focus areas are: Growth and Differentiation; Brain, Cognition and Behaviour; Epidemiology; Infection and Immunity; Life Sciences and Biocomplexity; Drug Innovation; Cardiovascular Research and Earth and Sustainability. In view of their range and diversity, some focus areas include several Master’s and PhD programmes. An overview of the focus areas, together with the associated Master’s and PhD programmes, can be found in table 1.

1.3 The mission of the Graduate School of Life Sciences
The primary objective of the GS-LS is to train future scientists who will be capable of drawing on their acquired knowledge, understanding and skills to conduct top-class research in an international context. The GS-LS also gives Master’s students the opportunity to qualify for matter-related, policy and management positions with government institutions and industry (particularly the pharmaceutical industry), and for positions in the fields of science communication.

1.4 The strategy of the Graduate School of Life Sciences
The ambition of Utrecht University as a leading Research University also includes contributing actively to training upcoming generations of new researchers. The GS-LS research programmes are backed up by internationally accredited, reputed research institutes at Utrecht University. Here, the international scientific community constitutes the frame of reference. Students are given the opportunity, and are encouraged, to follow parts of their studies abroad. All educational activities are research-intensive and there are emphatic links with sound research and good researchers. All the Master’s programmes at the Graduate School are delivered entirely in English from the start.

1.5 The organisation of the Graduate School of Life Sciences
All of the secondary processes that are important for education (administration, information, recruitment, selection, educational development, examination, quality control and facilities) have been developed on the basis of the mission: training top researchers in interaction with top research. The PhD curriculum at the school has also been organised as thematic PhD programmes on the lines of the Master’s programmes. This means that the GS-LS is developing on American lines with an internationally recognisable ‘Graduate Programme’ consisting of Master’s and PhD courses.

Sources consulted for the training plan of the Graduate School of Life Sciences of Utrecht University
Table 1. Master's and PhD research programmes of the Graduate School of Life Sciences

<table>
<thead>
<tr>
<th>Focus area</th>
<th>Research Master's Programmes</th>
<th>PhD Programmes</th>
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<tbody>
<tr>
<td>Neuroscience &amp; Cognition</td>
<td>Neuroscience &amp; Cognition (2 tracks)</td>
<td>Cognition And Behaviour</td>
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<td>Utrecht</td>
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<td>Clinical &amp; Experimental Neuroscience</td>
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<td>Cardiovascular Research</td>
<td>Biology of Disease</td>
<td>Cardiovascular Research</td>
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<td>Drug Innovation</td>
<td>Drug Innovation</td>
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<td>Earth &amp; Sustainability</td>
<td>Environmental Biology</td>
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<td>Epidemiology</td>
<td>Epidemiology Postgraduate</td>
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<td>Toxicology &amp; Environmental Health</td>
<td>Toxicology &amp; Environmental Health</td>
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<tr>
<td>Growth &amp; Differentiation</td>
<td>Cancer Genomics &amp; Developmental Biology and Technology</td>
<td>Cancer Genomics &amp; Developmental Biology</td>
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<td>Clinical &amp; translational Oncology</td>
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<td>Regenerative Medicine</td>
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<td>Infection &amp; Immunity</td>
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<td>Infection &amp; Immunity</td>
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<td>Life Sciences &amp; Biocomplexity</td>
<td>Molecular and Cellular Life Sciences</td>
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<td>Biomedical Image Sciences</td>
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<td>Computational Life Sciences</td>
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<td>Medical Imaging</td>
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Chapter 2. The Master’s programmes of the Graduate School of Life Sciences of Utrecht University

Brief description of the Master’s programmes

Biology of Disease

Biology of Disease studies disease mechanisms via internships in pre-clinical and clinical research in medical, biomedical, biological, industrial and veterinary labs. Two tracks are offered:

1. Cardiovascular research: biomolecular, electrophysiological and clinical aspects of cardiac arrhythmia, stem cells (cardiac progenitor stem cells), chronic heart failure, cardiac hypertrophy and issues of heart transplantation, cardiac surgery and MRI. Within the theme Atherothrombosis, research is aimed to enhance knowledge concerning vascular remodeling, plaque vulnerability, relevance of toll-like receptors, coagulation, arteriogenesis, thrombogenicity of platelets and protein misfolding.

2. Biology of Disease offers the opportunity to focus on more than one clinical speciality, enabling students to conduct research projects on different subjects and diseases in various pre-clinical and clinical labs. The central theme of the Master’s programme in Biology of Disease is the translation of a clinical problem (disease) into a scientifically secure experiment or model in order to study the underlying mechanism of the disease. Such experiments and models can reveal therapeutic leads. Research questions may relate to all organisational levels of the body.

On completing the programme, you will be able to use various advanced research techniques. The Master’s programme in Biology of Disease is particularly suited to performing disease-related research in co-operation with clinical and pre-clinical staff.

Biomedical Image Sciences

Biomedical Image Sciences is an interdisciplinary Master’s programme at the intersection of the exact and biomedical sciences, focused on biomedical imaging, image processing and medical physics. It is an appropriate choice for students with a BSc degree in an exact discipline who want to work in a biomedical environment, and for students with a BSc degree in a biomedical discipline with a strong interest in exact science.

Biomedical Image Sciences offers courses in the exciting area of biomedical imaging. The research character of the second year of the Master’s programme offers students the chance to actually contribute to the solution of relevant clinical problems. The close relation with the PhD programme Medical Imaging (ImagO) guarantees that both the educational programme and the research topics will be at the cutting edge of developments in medical imaging.

Alumni can pursue a career in a research institute or in industry, in either theoretical or application-oriented fields. Possible positions are, for example, as a researcher or developer with Philips Healthcare, the Netherlands Cancer Institute, or the Netherlands Organisation for Applied Scientific Research (TNO). Becoming a PhD student is another option for graduates.

Cancer Genomics and Developmental Biology

Cancer Genomics and Developmental Biology is aimed at research in the field of molecular developmental biology and genetic processes in plants, animals and humans. Fundamental developmental processes are frequently affected in human disease. Many of the important genes and mechanisms controlling development also regulate adult physiology, and deregulation may result in pathological conditions. Our understanding of
the genome (all genes) and the proteome (all proteins) is increasing rapidly, but the regulatory processes that shape our bodies (and, when affected, cause diseases such as cancer) are still poorly understood and require fundamental research. New genomics technologies are now enabling us to monitor the expression of some 20,000 genes simultaneously and to determine which genes are active. These techniques not only help us to better understand physiological pathways, but also help to identify those genes involved in disease and trace their mutations more easily.

The Master’s programme in Cancer Genomics and Developmental Biology trains students in this research field, building upon the knowledge and methods from information technology applied to biomedical systems and processes. Students on this programme will learn to explore the mysteries of embryonic growth, stem cells, signalling, gene regulation, evolution, and development in relation to health and disease.

Drug Innovation
Drug Innovation is aimed at interdisciplinary research in the field of innovation and usage of drugs, biologicals (vaccines, monoclonal antibodies, gene therapeutics) and diagnostics. Facts:

• The medical revolution since World War II has been heavily based on the discovery of new drugs;
• Drugs improve health at a relatively low cost;
• Enormous sums of money are spent on research to discover new drugs.

More facts:

• No new class of antibiotics was discovered between 1962 and 2000;
• More and more micro-organisms have become resistant to most drugs;
• There is no cure for many chronic diseases.

In today’s world there is a growing need for new and innovative drugs, vaccines, biologicals, diagnostics and gene therapeutics, particularly now that people are getting older and micro-organisms are becoming more resistant to drugs. To meet this demand, scientists are continually using and adapting state-of-the-art technology from many disciplines, such as medicine and veterinary medicine, biology, chemistry, pharmaceutical sciences, physics and computer science. These technologies should ensure that new drug candidates keep emerging from the drug pipeline. This unique MSc programme is intended to train enthusiastic researchers to make a contribution to drug innovation in research institutes, the pharmaceutical and biotechnology industry, their own start-up companies or policy-making in science and health care. Both nationally and internationally (e.g. in Europe, America), there is an enormous need for scientists trained in state-of-the-art techniques in bioinformatics, combinatorial chemistry, pharmacogenomics, proteomics, drug delivery and epidemiology. Graduates with an MSc in Drug Innovation should have no problem finding a PhD project for further training and research.

Environmental Biology
Environmental Biology explores environmental interactions from an evolutionary and historical perspective, with organisational levels ranging from genes to ecosystems. As an MSc student in Environmental Biology you will study the biological mechanisms underlying the interactions of plants, animals and microorganisms with the biotic and abiotic environment, including evolutionary and historical aspects. Environmental Biology is multidisciplinary in its approach and includes organisational levels ranging from genes, cells, organisms to populations and ecosystems. The following examples illustrate typical research questions in environmental biology:

• How does global change affect biodiversity
• How can tropical rain forests be preserved?
• How do plants adapt to flooding?
• How do plants defend themselves against harmful pathogens and insects?
• How do plants respond to light?
• How do fungi choose from nature’s menu?
• How can animal behaviour be explained from an ecological and evolutionary perspective?

Environmental Biology trains you to a high academic level. You will, individually or in a team, be challenged to solve fundamental and applied environmental biology problems. You will learn about the most modern experimental and mathematical methods and techniques and also how to apply molecular and genetic tools to a wide range of biological problems.

All courses and practical training are given in English by a team of internationally distinguished scientists.

Epidemiology / Epidemiology Postgraduate
Epidemiology examines the distribution of health and morbidity in populations and their determinants. It is a scientific discipline increasingly asked for in clinical (human, pharmaceutical or veterinary) research, industry and policymaking. With ‘evidence-based medicine’ setting new standards, specialists are needed in the design, data collection, analysis and interpretation of epidemiological and health research.

Students will acquire extensive knowledge and practical skills in epidemiology and statistics. You will become familiar with methods for quantitative analysis and evaluating occurrence relations in human or veterinary medicine and public health. You will gain expert knowledge in research design and analysis and its application to clinical practice. The knowledge and skills gained form a solid basis for health research and disease control programmes, including applications in developing countries. With graduation, students are eligible for registration as Epidemiologist A (Dutch registration system).

In epidemiology, cause, detection, prognosis and treatment of disease can be the focus of investigation. In epidemiological terms we talk about etiologic, diagnostic, prognostic or therapeutic research. The domain of study may also vary. Fee specialisations are offered in the programme:

• Clinical Epidemiology
• Environmental Occupational Epidemiology
• Epidemiology of Infectious Diseases
• Medical Statistics
• Pharmaco-epidemiology
• Veterinary Epidemiology

Epidemiology is characterised by a well-established set of principles and methods for applied research. At the same time, the context in which these methods are applied can be quite diverse. The unique combination of epidemiological research groups in medicine, veterinary medicine, pharmaceutical sciences and risk assessment science in Utrecht University offers the possibility for education over the full spectrum: from animal to human, and from population to patient.

Epidemiology Postgraduate is a 1.5 year variant of the Master’s programme in Epidemiology; it is for those students who already have a Master’s degree in Life Sciences.
Infection and Immunity
Infection and Immunity studies the molecular, cellular and clinical aspects of pathogens and immune responses. Infectious diseases and disorders of immunity are a continuous threat to the life and well-being of humans and animals. The aim of the participating groups is to improve the prevention, diagnosis, and treatment of infectious diseases and disorders of immunity by performing basic and clinical research in a multidisciplinary approach.

The aim of this MSc programme is to train the next generation of researchers, thus ensuring the continuity and quality of research in the field of immunology and infectious diseases. There is a great demand for scientists with expert knowledge in both the fundamental and disease-oriented aspects of immunology and infectious diseases. They can work in:

- university hospitals (disease-oriented research)
- research institutes (fundamental research)
- pharmaceutical industry (applied research)
- policy-making in science and health care
- education

Molecular and Cellular Life Sciences
Molecular and Cellular Life Sciences focuses on understanding of cellular function at the molecular level and rests at the crossroads of chemical, biological, physical and computational science.

Research groups from the Faculties of Science (Biology, Chemistry, Pharmacy, Physics), Medicine and Veterinary Medicine are all involved in this interdisciplinary programme. It is also directly linked to the PhD programmes of the Bijvoet Centre for Biomolecular Research and the Institute of Biomembranes and the PhD programme Theoretical Biology and Bioinformatics.

Powerful modeling systems which have already been established will be even more effective when used in combination. The programme offers expert training in several of the most prominent biological models, including bacteria, fungi, plants and animals, as well as cultured mammalian and insect cells. Students are trained in state-of-the-art techniques ranging from advanced methodologies in structural biology (X-ray, NMR, modeling), genetics (genomics) and cell biology (microscopy, proteomics) and computational approaches (computational and theoretical biology).

In the past, research has often focused on a single level of observation: molecules, cells, tissues or organisms. Courses and projects in the programme emphasize crossing former boundaries. The current challenge is to bring all these levels together into a comprehensive understanding of life.

Neuroscience and Cognition
The neurosciences comprise a vast, multidisciplinary field aimed at understanding normal and pathological brain functions. It is this multidisciplinary character that makes the neurosciences so very interesting and challenging. To be able to plan experiments, collect, interpret and analyse data in this field and to get an idea of how the brain really functions, you need to know how to combine information from the different disciplines. Such a common action as seeing provides a clear example of the complexity of neuroscience: when you see something familiar many different things occur in your brain – cognition, since you recognise it; plasticity of neurons, since you remember; signal transduction, what you see has to be “translated”; behaviour, you act on what you see.

This international Master’s programme teaches the fundamental principles of neuroscience and will train to conduct neuroscience research in a multidisciplinary team. There are two tracks:

- Cognitive Neuroscience
- Experimental and Clinical Neuroscience

These programmes also offer some additional features: students have the opportunity to meet international scientists in the neuroscience and cognition fields during Master classes, the student symposium, and lectures provided by the participating institutes. They may participate in the PhD Summer School and the programme provides excellent bio-informatics facilities.

Regenerative Medicine and Technology
The new master’s programme, Regenerative Medicine and Technology, will start in September of 2012 in cooperation with the department of Biomedical Engineering of the Eindhoven University of Technology. This Master’s programme aims to train scientists to innovate within the field of regenerative medicine from their multidisciplinary background. The development and application of new technologies will be a major focus. The term ‘technology’ can be interpreted in a broad sense: ranging from specific cell culturing techniques, the use of biomaterials, to computer models and imaging modalities. Students can enroll at either of both institutes.
Toxicology and Environmental Health

Toxicology and Environmental Health deals with the health risks of exposure to potentially harmful agents in the environment, at the workplace and through the food chain. This programme is run by the Institute for Risk Assessment Sciences (IRAS) and it aims to train students in knowledge of the field, in developing practical skills, and in recognising potentially hazardous environmental factors. The effects caused by such exposure on the health of man, animals and the environment are studied. Fundamental and applied research is performed into environmental factors of a chemical, biological or physical nature, with qualitative and quantitative analyses and the evaluation of exposure of man and animals to such factors.

The MSc programme will prepare students for a PhD position in fundamental or applied research, or for a direct societal position at an academic level. The programme also aims to form a basis for the professional recognition and registration as a toxicologist, epidemiologist or occupational hygienist.

The course has a strong multidisciplinary character in the life sciences. Expertise and practical skills in diverse biomedical and life science areas are integrated into the typical IRAS disciplines: toxicology, environmental and occupational epidemiology, and occupational hygiene. IRAS implements its MSc programme in close collaboration with the Dutch National Institute of Public Health and the Environment (RIVM, Bilthoven) and with TNO-Quality of Life (Zeist).

The programme is internationally oriented and all courses are in English. Dutch and international students are encouraged to apply and MSc students are stimulated to undertake international activities in their programme.

Chapter 3.
Administrative organisation

3.1 The executive vision of the Graduate School of Life Sciences

Research training needs solid foundations, with internal safeguards for the quality of the training and counselling of young researchers, in both the Master's and PhD phases. At Utrecht University, the profile of and safeguards for research training are anchored in the Graduate Schools. Internationally, the ‘Graduate School’ has become the dominant organisation model for both external profiling and internal safeguards for research training. As one of the leading Research Universities, Utrecht University has also opted for this model.

Utrecht University has six Graduate Schools:

- Arts & Humanities;
- Geosciences;
- Law, Economics and Governance;
- Life Sciences;
- Natural Sciences;
- Social & Behavioural Sciences.

Utrecht University has a matrix organisation structure. Accountability for education and research is organised on vertical lines, passing through the dean, faculty and department. Horizontally, there is collaboration in the areas of education and research in Graduate and Academic Schools, and in the Focus and Mass Areas respectively.

Through the Graduate School, Utrecht University provides an international target group with strong research training consisting of Master's and PhD lines. These degrees rely, in the first place, on the quality of the research in the research institute.

To maintain and further the strength of our research training, a good match is needed between the Master's and PhD phases. We also need to adapt to the increasing internationalisation of scientific research, and to establish a clear profile with respect to research training in other universities.

3.1.1 The administrative organisation of the Graduate School of Life Sciences

For the purposes of external profiling and internal safeguards, the GS-LS has the following bodies for all research Master's programmes:

- the Board of Studies (BoS)
- the Executive Management (DB-BoS)
- the Educational Committee
- the Board of Examiners
- the Board of Admissions
- the Project group
- the Life Sciences Representatives

These bodies coordinate and monitor the programmes, whereas the responsibility for the content and implementation resides with the Master's programme committees.
3.2 Administrative bodies and their competences
Responsibility for the GS-LS has been determined on the basis of a joint arrangement from the deans of the Faculty of Science, the Faculty of Veterinary Medicine and the Faculty of Medicine (the Utrecht Life Sciences deans). The responsibility for quality of education resides with the head of the School, also Chair of the Board of Studies by mandate from the deans.

Legally speaking, the GS-LS currently supplies six separate Master's degrees, each with a CROHO-label and separate accreditation. Three of these degrees Biological Sciences, Chemical Sciences, and Pharmaceutical Sciences answer directly to the head of the School. As for the other three degrees, Biomedical Sciences, Health Sciences and Neuroscience and Cognition, the head of the school has given his mandate to the Biomedical Sciences director. Both the head of the school and the degree director Biomedical sciences are each supported by a degree coordinator.

It is conceivable that, within the foreseeable future, there will be a single Life Sciences CROHO-label. During the transitional period, all legal requirements relating to the six 'old' degrees will be met and preparations will be made for merging the organisation in the areas of administration and organisation.

For example, each of the degrees has delegated their examination subcommittee to the Graduate School of Life Sciences Board of Examiners. The members of the Board of Examiners are also members from all three different faculties.

The GS-LS also has an educational committee in the sense of section 9.18 of the Higher Education Act for the degrees and programmes housed with the School. In addition, the Faculty of Science also has educational advisory committees. Teaching staff and students are represented in these educational advisory committees on an equal footing. For the purposes of the Life Sciences degrees, the Faculty of Science has the following educational advisory committees: Biological Sciences, Chemical Sciences and Pharmaceutical Sciences. These committees safeguard representation and consultation arrangements from the perspective of the CROHO-registered degrees. The members of the Life Sciences educational committee are also members of the relevant educational advisory committees.

Finally the Board of Admissions consists of the four involved degree directors.

3.2.1 Board of Studies of the Graduate School
Task
The Board of Studies (BoS) is responsible for the organisation and coordination of education and the quality of the Master's programmes. To that end, it deploys the following activities.

1. The appointment of a Board of Admissions for the Master's programmes

Pursuant to a nomination from the BoS, the joint deans appoint a chair to the Board of Admissions. The BoS decides on appointment of other members. The Board of Admissions decides about admissions to the Master's programmes of the Graduate School and maintains the standards that the BoS sets for admissions.

2. Master's quality safeguards

The BoS monitors the quality of the education according to the Quality control plan master degrees. This does not only include the quality of the separate programmes but also the deployment of teaching staff, adequate academic counselling for students, referrals between the Master's programmes as well as course exchanges and flexibility in study selection.

3. The Board of Studies monitors:
The BoS monitors joint activities for students and staff such as conferences and seminars so that research Master's students and staff engage with the Graduate School’s ‘graduate community’.

Members
The chair of the BoS is an independent professor from one of the participating faculties who is also appointed as head of the school by the deans. In addition, the BoS has two vice-chairs; one from the Faculty of Medicine and one from the Faculty of Science; who are appointed on a personal basis by the Utrecht Life Sciences joint deans. The BoS consists of all programme directors for the research Master's programmes and representatives from Master's and PhD students. The BoS is supported by a secretary. The secretary of the Graduate School is also the secretary for the meetings of the deans of Utrecht Life Sciences, the strategic alliance of the Faculties of Science, Medicine and Veterinary Medicine The leading members of the PhD programmes are not members of the BoS. In practice, many of the PhD programme directors will also be programme directors in the Master's programmes and this overlap will result in input from the PhD programmes. The BoS meets twice a year.

Executive Management of the BoS
The BoS of the GS-LS has an executive management that meets more frequently (at least once a month). The executive management deals with day-to-day business, maintains ongoing contacts with the Educational committee, Board of Admissions and Board of Examiners (see below) and the management of the Master's programmes and PhD programmes, and prepares policy decisions for the BoS.
The executive management of the BoS comprises:

- the chair
- the two vice-chairs,
- the secretary
- three Master’s programme directors
- one Master’s and one PhD student

3.2.2 Educational Committee

Task
The primary task of the Life Sciences educational committee is to appraise the quality of the studies in the programmes while striving to achieve a uniform approach to monitoring. In this respect, it has a advisory role. The Educational Committee does not limit its activities to exercising supervision; it is also involved in implementation in the sense that it states recommendations about what needs to be done pursuant to the results of student surveys. The Educational Committee draws up the standard questionnaires for this purpose. The Educational Committee reports to the BoS. Through the intermediary of the BoS, the Educational Committee monitors contacts with the individual programmes and their programme directors and programme coordinators. It does so because it plays an essential role in the interpretation of evaluations and their implementation in concrete action. The educational committee also advises the BoS, upon request or at its own initiative, about the Education and Examinations Regulations (EER). The educational committee ensures that the educational advisory committees are given the opportunity to make recommendations about the draft EER.

Members
Teaching staff and students are represented in the educational advisory committees on an equal footing. The members of the educational committee are appointed by the dean. The students and teaching staff from the Faculty of Science on the educational committee are also members of the educational advisory committees for Biological Sciences, Chemical Sciences and Pharmaceutical Sciences.

3.2.3 Board of Admissions

Task
The Board of Admissions decides about student applications and enrolment. This is partly a matter relating to content (on the basis of recommendations from the programme committees) and partly an administrative matter dealt with by Student Service Centre, the Central Student Administration, and the Education and Student Affairs departments of the faculties. The programme coordinators act as intermediaries for the purposes of assessing the files. They consult the programme committee of the programme in question and pass the result on to the administration. The administration then completes the processing of the application in accordance with the rules agreed at Utrecht University. Admissions decisions are signed under the responsibility of a member of the Board of Admissions.

Members
The committee comprises four degree directors (Pharmacy, Chemistry, Biology, and Biomedical Sciences/Health Sciences/Neuroscience & Cognition). One of the degree directors is appointed by the deans as chair. Currently it is chaired by the degree director of Biomedical Sciences/Health Sciences/Neuroscience & Cognition. The Board of Admissions answers to the joint deans and it coordinates its policy and findings regularly with the BoS.

3.2.4 Board of Examiners

Task
The core activities of the Board of Examiners include:

- to ensure the quality of the examinations,
- the adoption of guidelines and instructions in order to assess and record the quality of examinations,
- assessing research project and theses applications selected by students in terms of content, scientific value and relevance, and standard;
- the granting of exemptions from taking one or more examinations.
• to decide on special requests regarding the study programme
• to deal with formal aspects concerning fraud or plagiarism
• assessing graduate files on the basis of the examination requirements stated in the Education and Examinations Regulations (EER);
• The Board of Examiners will draw up rules and regulations on the implementation of the tasks and authorities
• Each year, the Board of Examiners will draw up a report on its work. The Board of Examinations will submit this report to the BoS.

**Members**

Pursuant to nominations from the BoS, the joint deans appoint a Board of Examiners for the GS-LS. The Board of Examiners consists of a chair and members of the degrees in Biological Sciences, Biomedical Sciences, Chemical Sciences, Health Sciences, Neuroscience and Cognition, and Pharmaceutical Sciences. Furthermore, the board of examiners include an assessment panel, consisting of five members and a chair appointed by the chair of the Board of examiners. This assessment panel exclusively deals with assessment of the quality of examinations.

### 3.2.5 Master's programme committees

**Task**

The programme committees for GS-LS Master's programmes are responsible for matters within their own Master's programme. They assess applications for admission on contents and advise the Board of Admissions about new admissions. They are also responsible for the content and quality of the core courses and for the coordination of the research projects conducted by students as part of the Master's programmes. The programme coordinators maintain contacts with the students relating to their study planning and approach.

**Members**

Each programme committee for a research Master's comprises the programme director and programme coordinator for the Master's programme in question, together with a number of senior teaching staff directly involved in the programme.

### 3.2.6 Project team

**Task**

The Project team supports the BoS by researching and advising on all educational issues. Advice may be aimed at the BoS itself or any other administrative body of the School.

**Members**

The team consists of one chair, appointed by the BoS and two members from within the organisation, as well as one external member from COLuu on a project basis. Depending on the projects at hand, the team can invite other temporary members to join the team as well.

### 3.2.7 Life Sciences Representatives

**Task**

Life Sciences Representatives (LSR) is a student initiative to represent the interests and rights of all Master's students of the Graduate School of Life Sciences at Utrecht University. They:

- Represent the interests of all Master's students of the GS-LS at the educational level,
- Feedback between the student members of the Educational Committee and BoS and the rest of the students,
- Identify problems Master's students experience within the course of their studies and try to resolve them, either by:
  -> reporting and discussing the problems or complaints in the Educational Committee, BoS or programme coordinator meetings,
  -> taking direct action or passing on the problem to those who are fit to handle it,
- Fill the vacant student positions in the Educational Committee and BoS at the start of each new academic year,
- Increase the coherence between the different programmes within the GS-LS,
- Promotion of the LSR and its functions to the new Master's students every year,
- Handle the applications of putative new LSR members at the beginning of every academic year.

**Members**

The LSR consists of at least one Master's student of every programme within the school, and preferably one from each track of the Master's in Neuroscience & Cognition. All student members of the Educational Committee and BoS are part of the LSR. In addition, at least one representative of the Life Sciences associated study associations be a member of the LSR.
Chapter 4
The curriculum of the Graduate School of Life Sciences

The School aims to deliver outstanding independent researchers in the field of Life Sciences. These researchers will be familiar with the latest developments in their field and be able to develop this scientific field further on the basis of scientific and socially relevant questions and challenges. Every Master’s graduate should, in principle, be able to qualify for a PhD position and preferably also have ambitions to pursue a career in scientific research. To achieve this goal, the School supplies advanced research-intensive education in which education and research go hand in hand. An important underlying principle here is to ensure that students benefit optimally from the presence of top research and top researchers.

4.1 Learning objectives for the Master’s training
Students must be able to qualify for a PhD position and also be capable of fulfilling positions in policy, management, industry and education. These objectives have been stated in terms of the learning objectives below, which correspond to the widely used Dublin descriptors for Master’s programmes. The descriptors have been stated in terms specific to the entire field of Life Sciences. The individual Master’s programmes at the GS-LS elaborate these School-wide learning objectives further at the programme level.

Graduates will have profound knowledge of, and insights into:

1. at least one of the specialised subjects of Life Sciences. With this knowledge graduates are able to make a substantial contribution to the development and/or application of scientific concepts and methods, often in a research context;
2. important, recent developments within the Life Sciences. Graduates are able to point out the implications of these developments on the Life Sciences field and society;
3. the way to adequately use and interpret specialist literature in at least one of the subjects of Life Sciences.

Graduates will become skilled in:

4. translating a Life Sciences problem into a relevant research question, suitable for research development or product design;
5. designing a suitable research plan to test the formulated research questions, according to methodological and scientific standards;
6. independently performing research, with the required accuracy. Graduates are able to handle, analyse, interpret and evaluate the empirically derived data in a correct manner;
7. discussing the outcomes of empirical research and linking them with scientific theories;
8. indicating the importance of research activities for solving a biomedical question or problem, if applicable from a social perspective;
9. critically reflecting on their own research work in Life Sciences, from a social perspective;
10. comprehensibly reporting research results verbally and in writing, to specialised and non-specialised audiences in an international context.

Graduates will display attitudes that enable them to:

11. function effectively in a multidisciplinary research team;
12. reflect on their own development and study career. If necessary, graduates are able to motivate and adjust themselves;
13. function independently and result oriented in a competitive labour market;
14. to be eligible for a PhD position or a position in other sector.
4.2 Educational philosophy

4.2.1 Research-Intensive Education

The mission of the GS-LS is to train future scientists who will be capable of drawing on their acquired knowledge, understanding and skills to conduct top-class research in an international context. Direct linkage between education and high-quality international research is therefore important. The curriculum must be research-intensive and students must make the most of the presence of highly qualified researchers in their immediate vicinity. This fits with the positioning of Utrecht as a Research University. Fifteen themes have been defined at Utrecht University as the focus for research at the university. These are known as the ‘focus areas’. Eight of these themes are covered by the Life Sciences: ‘Neuroscience & Cognition’, ‘Cardiovascular Research’, ‘Drug Innovation’, ‘Biodiversity’, ‘Epidemiology’, ‘Growth & Differentiation’, ‘Infection & Immunity’ and ‘Earth & Sustainability’. The Master’s programmes are based directly on, and are located in, these focus areas.

The didactic concept developed to achieve this goal is ‘Research-Intensive Education’. Learning to conduct research by engaging in research plays an important role here. At the same time, this process must also be effective and efficient enough. Students must acquire the right experience to the right degree; enough to learn from, without things becoming routine. Furthermore, they must process this experience in a conscious way to ensure that the results of the learning process are enduring. Rational planning for the process of learning and development-based counselling are therefore required.

Students must develop domain-specific knowledge and skills in a Life Sciences field. They must also have, and continue to develop, more general and personal traits such as an enquiring attitude, determination and self-reliance. Ultimately, they must be able to design and implement independent scientific research, achieving results that will be published in leading international journals.

4.2.2 The research cycle

For the elaboration of research-intensive education, the research cycle is an important tool for providing structure.

Elements of the research cycle covered by the curriculum include:

- translating an observed problem into a concrete study question
- reviewing existing research critically
- drafting a theoretical framework
- drafting a research plan
- selecting techniques for application
- implementing the plan
- analysing data
- interpreting data
- ongoing feedback and thinking about research
- inviting, and dealing with, peer review
- scientific reporting and presentation of results

All these elements must be dealt with in a structured way in the research projects. The counselling/the educational learning process must be geared to transforming students into researchers. In all cases, it is important for students to be given enough room to make and answer for their own decisions.

4.2.3 Broader development

The research cycle emphasises ‘action’. In addition, all sorts of attitudes and personal traits are important for successful ‘action’ such as ambition, self-reliance, stamina, creativity, and communications about progress, results and problems. The School devotes attention to the development of these areas. Many developments take place where disciplines meet. Students are given the opportunity to see what ‘the neighbours’ are doing. They are also actively involved in seminars, work discussions and other meetings at which researchers from various fields in the Life Sciences meet. This interaction with researchers must be cultivated as much as possible.

4.2.4 Knowledge base

Students enter the school from different backgrounds. Some of them know a lot about the field in question; others have much less experience. To conduct research, a large and up to date knowledge base is required. The question is always when this should be worked on, and how. The various programmes at the GS-LS have taken different decisions in this respect that are appropriate to the nature of their fields. The nature of experimental work (laboratory or field), the accessibility of the phenomena (direct measurement/observation or the statistical processing of population data acquired with difficulty), or the nature of the knowledge (hierarchical and strongly interrelated or more eclectic) can vary in fundamental ways. Consequently, in some fields, knowledge is acquired “at the coalface”. In other fields, the first step is to acquire a thorough theoretical grounding. In all cases, students must be able to acquire a complete picture of the field, to answer for their own research on the basis of the requirement for the development of new knowledge, and to see how the results of their own research are related to the state of the art.

What is true for knowledge also applies to skills. Some technical skills are offered and learnt ‘just-in-time’ when the need arises. Sometimes, it is sensible to first sketch a clear picture of available techniques, particularly when the selection of those techniques is an important component of the operationalised research question. As a result of their experience with research and their own ongoing research, supervisors are role models for students. Good supervisors can provide effective and efficient counselling for the development of substantive knowledge of the field and specific research skills. Furthermore, they supervise students on their way to self-reliance, encourage an enquiring attitude, and assess student performance. Supervisors, including trainee researchers, are monitored during the development of their skills by means of a package of training and coaching. Through the exchange of ‘good practices’ at education days, the level of research-intensive education throughout the School is raised.

4.2.5 Counselling

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4.3 The curriculum at the Graduate School of Life Sciences

4.3.1 Entrance to the Master’s programmes

The Master’s programmes are intended for students who have completed a university bachelor’s degree in Biomedical Sciences, Biology, Chemistry and Pharmaceutics or an associated equivalent degree, and who have a clear interest in research in the area of Life Sciences and a sound mastery of English.

4.3.2 Master’s programmes at the School

The School has Master’s programmes that cover the fields of Life Sciences, from micro-organisms to plants, animals and humans, and from the molecules of life to health and disease. The GS-LS is responsible for the organisation and coordination of the curriculum and for monitoring the quality of the curricula of the Master’s programmes. The deans may establish new programmes or terminate others pursuant to recommendations from the BoS. The BoS will appraise requests to that effect on the basis of theme, school requirements and quality.
The Master’s programmes are part of accredited degrees registered with the Central Register for Training in Higher Education (CROHO) which have their own CROHO labels. A number of programmes can be followed using different degrees and therefore have several labels. The table below gives an overview of the programmes and the associated CROHO labels.

<table>
<thead>
<tr>
<th>Master’s programmes</th>
<th>CROHO label</th>
<th>Biomedical Sciences</th>
<th>Biological Sciences</th>
<th>Chemical Sciences</th>
<th>Health Sciences</th>
<th>Neuroscience and Cognition</th>
<th>Pharmaceutical Sciences</th>
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<tbody>
<tr>
<td>Biology of Disease</td>
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<tr>
<td>Biomedical Image Sciences</td>
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<td>Cancer Genomics and Develop. Biology</td>
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<td>Drug Innovation</td>
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<tr>
<td>Epidemiology</td>
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<tr>
<td>Epidemiology Postgraduate</td>
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<tr>
<td>Infection and Immunity</td>
<td>x</td>
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<td></td>
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<tr>
<td>Neuroscience and Cognition</td>
<td>x</td>
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<td></td>
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<tr>
<td>Environmental Biology</td>
<td>x</td>
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<tr>
<td>Molecular and cellular life sciences</td>
<td>x</td>
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<tr>
<td>Toxicology and Environmental Health</td>
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<td></td>
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<tr>
<td>Regenerative Medicine and Technology</td>
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N.B. The Neuroscience and Cognition programme includes two tracks:
- Cognitive Neuroscience
- Experimental and Clinical Neuroscience

4.4 Structure of the Master’s programmes

The Master’s programmes last two years; they comprise a total of 120 credits (EC). The main component includes two research projects, and a major and a minor project. In addition, each programme supplies one or more specific Master’s courses. Students also write a thesis and attend a number of seminars. Each programme also includes an elective component that can be used for deficiencies, additional courses or for additional research time.

The order of the curricular components is not strictly regulated. Each student makes his or her own timetable. However, many Master’s programmes do start with a specific introductory course. In general, this applies only to courses starting in September. It is advised to start with an introductory week before courses start in February also. This introduction should examine the central theme of the Master’s programme. Another precondition for the study relates to the major research project, which must be located at Utrecht University or the Utrecht UMC. For the minor project, students can also study elsewhere in the Netherlands or abroad.

In schematic terms, most* of the programmes are structured as follows:

<table>
<thead>
<tr>
<th>Minor research project</th>
<th>Compulsory courses</th>
<th>Elective component</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 EC</td>
<td>15 EC</td>
<td>12 EC</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Major research project</th>
<th>Thesis</th>
<th>Seminars</th>
</tr>
</thead>
<tbody>
<tr>
<td>51 EC</td>
<td>7.5 EC</td>
<td>1.5 EC</td>
</tr>
</tbody>
</table>

*There are three exceptions: Epidemiology, Epidemiology Postgraduate and Biomedical Image Sciences, programmes that involve a relatively large amount of theory and less practical research.

Programme-specific courses primarily serve to enhance knowledge and insight. A number of School-wide courses focus more on learning specific skills. For example, there are a number of School-wide courses, such as English for Academic Purposes, Career Planning and Professionalisation (in Dutch only), Laboratory Animal Sciences, Radiation Safety, Communicating Life Sciences, Basics of Biostatistics and Training in Educational Skills, each of which emphasise a specific skill. Components such as drafting research questions, conducting experiments and other elements in the research cycle are covered extensively during the two research projects.
Chapter 5.
The operational organisation of the Graduate School of Life Sciences

5.1 Process guidance
The GS-LS constitutes the administrative and operational setting for a large number of processes. One of the school's main responsibilities is therefore to manage those processes properly.

At the operational level, there are consultations between the stakeholders for each focus area. The main focus areas are: (1) internationalisation, (2) internal and external information and communications (3) the process of application and admissions, (4) the organisation of the educational learning process, (5) academic counselling and monitoring (6) internal and external quality control and (7) labour market orientation. Sections 5.2 through 5.8 discuss the procedures in the individual focus areas. This section looks at a few general operational processes.

The GS-LS works on a supra-faculty basis. The faculties in question (Science, Medicine, and Veterinary Medicine) are responsible for the operational processes. The GS-LS draws on the operational facilities of these faculties, and tasks, responsibilities and competences must be determined as unequivocally as possible. Here, a distinction is made between programme matters and questions affecting the School as a whole. The board of examinations, Board of Admissions and Educational committee all function on the level of the whole school.

Where possible, internationalisation will be coordinated and implemented at the School level so that it can also be used as a marketing instrument for important international contacts and ‘preferred partners’.

The Graduate School plays an important role in quality control for the curriculum. This primarily involves the field-specific requirements for the degrees, the programme learning targets and the educational learning process. The school does not have any direct responsibility for the quality of the teaching staff. This responsibility resides with the faculties. They are responsible for the teaching qualifications of their teaching staff (BKO and SKO qualifications), the Result & Development interviews, monitoring the standard of educational and field-related expertise and the adequate availability of staff. Relevant results of student surveys, educational results achieved, and areas meriting competence development for teaching staff are communicated by the School through the degree director and the programme director to the person conducting the Result & Development interview. Where there are reasons to do so, the Graduate School, in the person of the programme director, may get in touch with the person in the organisation to whom the lecturer answers directly.

5.2 Internationalisation and marketing

5.2.1 Importance of internationalisation
Our economy is developing into an international knowledge economy. This requires young, highly trained people who are adequately prepared to operate in an international working environment. The GS-LS therefore aims to train researchers who can play a central role in that knowledge economy. That means they must be able:

• to develop scientific knowledge in collaboration with fellow researchers who speak other languages;
• to communicate and disseminate this knowledge inside and outside their own field of research;
• to take into account international scientific and social conventions;
• to build up a network of international scientific contacts and relationships;
• in addition to their own language, to have a mastery of at least English at an ‘academic’ level.
This means that:
- all the Master's programmes at the GS-LS have been designed as international Master's in English;
- the research conditions in the departments linked to GS-LS are appealing for international top researchers;
- the target for the number of foreign students with a relevant educational history/background in the Master's programmes is 30%;
- the Master's programmes are dominated by current international research in the Life Sciences - themes closely match recent developments in those fields.

The curriculum of the GS-LS is designed so that students increasingly see the study as a preparation for an international scientific career in which neither the Netherlands nor Utrecht is the frame of reference, but 'the international scientific community'. This is made apparent to the outside world by activities such as exchanges of staff and students between the GS-LS and foreign Graduate Schools in the field of the Life Sciences, the recruitment of foreign teaching staff with specific expertise relating to one of the core themes, the establishment of institutional partnerships with foreign universities/Graduate Schools, encouraging mutual transfers of researchers and students by means of exchange programmes, research projects, exchanges of study components, etc. Of course, this all involves close collaboration with existing research institutions within current university policy frameworks geared towards internationalisation.

This objective will be successful if all the research programmes develop into 'transnational' educational settings in the field of Life Sciences, and if English becomes the official lingua franca at the GS-LS, even though this does not exclude Dutch being used where this is practical. Life Sciences works continuously on its 'Web presence': all sites are in English and make clear choices possible, even for students and future students who do not speak Dutch. There are customer-friendly services for international students, with particular attention being paid to accommodation, visa applications, etc.

Students in Life Sciences have acquired an international scientific culture that is demonstrated by, for example, a mastery of English, relevant international contacts, and an understanding of the latest state of the art in their research field.

5.2.2 Furthering international recruitment and mobility
In the Life Sciences Master's programmes, the programme coordinators are the people who are particularly involved in the recruitment of foreign students. They encourage Dutch students to engage in training in other countries. The recruitment figures for the various programmes can be found in Annex II. The UU target, 30% foreign students in each Master's programme, has not yet been achieved by all programmes.

Of the students who train in other countries, 80% find internships on the basis of a research domain, and the mediation of the research groups is often essential in this respect. After finding a research project, students can talk to a member of the internationalisation offices about the organisational side.

Two support centres have been established, one in the UMC Utrecht and one in the Faculty of Science, where knowledge about internationalisation is being concentrated for the purposes of advising students.

5.2.3 Furthering international collaboration
For the purposes of recruiting foreign students, Utrecht University staff visit five educational fairs annually on behalf of all Utrecht University Master's programmes. In 2007, they visited Greece, Turkey, Indonesia, India and China. Since 2008, they have been part of the regional policy of Utrecht University. With this regional policy, Utrecht University wishes to establish bilateral partnerships in the fields of research and education. In doing so, the university wishes to work university-wide to a greater extent than in the past with a limited number of selected leading universities - the Utrecht University Partners - in the various regions. Under the regional policy, regional ambassadors are appointed for each region. The GS-LS will avail itself of the services of these ambassadors. In addition, the Executive Board has earmarked a subsidy for a research partnership with the University of California. The GS-LS is examining the possibility of working together with this partner.

The aim is to build up international contacts for exchanges as early as the bachelor phase. For example, as part of the Biomedical Sciences bachelor, structural bilateral exchange arrangements were established with effect from September 2007 with Tromsø (Norway) and Lund (Sweden).

Subsidies and grants are also used. For foreign students outside the EU there is the ‘Utrecht excellence scholarship’. There are also a number of other grants for exchanges within Europe: Leonardo da Vinci for student internships, Marie Curie for researchers, and Erasmus Mundus for Master’s courses. With help from the Netherlands Fellowship Programme (NFP), students from less developed countries can enrol for a Master’s programme. Students can also apply for private funds.

Another important condition for success is the presence of exchanges at the PhD and teaching levels. The people concerned act as ambassadors for Life Sciences abroad.

5.3 Internal and external information and communications
Graduate schools are a relative new phenomenon in the Dutch university world. In order to make the role and significance of the GS-LS clear to professorial groups, information activities are required. Supplying information about the content of the Master’s programmes to potential students requires a very different approach. Within Life Sciences, the approach and the content of the information activities is determined by the target group in question. The goal of the internal and external information for potential students is therefore to make sure that the right student is in the right place, in the right Master’s programme. There are other target groups in addition to potential students.

5.3.1 Target groups for information activities and communications
Both inside and outside Utrecht University, target groups have been defined that have either direct or indirect contacts with the GS-LS. All these groups are approached in appropriate ways. The following target groups have been defined:

At Utrecht University:
- Participants in GS-LS
  - faculties
  - professorial groups
  - members of staff
  - current Master’s students
- Non-stakeholders in GS-LS:
  - other Graduate Schools
  - other faculties
  - current bachelor students (potential Master’s students)

Outside Utrecht University
- other universities, Dutch and international
- current bachelor students not studying at Utrecht University
  - university graduate students (Dutch/international)
  - HBO bachelor students
5.3.2 Organisation and activities
The GS-LS has a communications team consisting of spokespeople for the Faculties of Science, Medicine, and Veterinary Medicine (including the webmaster of the GS-LS), the secretary of the School, and the degree coordinators of the Master's programmes. This team is responsible for internal and external communications.

The policy relating to information activities and communications for the Graduate Schools is generally formulated at the Utrecht University level. In this context, the Life Sciences spokespersons can fall back on a memorandum from the Utrecht University Communications Service Centre from March 2007 entitled “Communication profiling for Utrecht Graduate School and prestige Master’s”.

Potential students
At the GS-LS, School-wide information has been developed for potential students. The School presents itself as a unit at all external publicity activities (Utrecht University MSc information days, Master’s fair etc.). Posters for all Master's programmes are available in a uniform format for use at information events, as are brochures for all Master's programmes designed to inform all potential students. The GS-LS uniform websites for all Master's programmes are updated continually. Actual visibility depends in part on the central Utrecht University policy relating to the Web presence.

Current students
Every academic year, a study guide is produced for the students in all Master's programmes. In addition, there is a website with relevant current information. In addition, information activities and communications for enrolled students are located primarily at the programme level and are, in part, informal in nature. The coordinators play the leading role in this respect.

A new initiative is the Master for Life Magazine, a digital newsletter with articles written by students for students on Lifes sciences related issues.

Direct GS-LS stakeholders
Master's programme directors and coordinators are informed through the meetings of the BoS and the Master's coordinator meetings about the activities of the GS-LS. A plenary GS-LS meeting followed by a dinner is organised at the beginning of each academic year.

The Project team organises educational seminars for all staff members bi-annually, in which workshops/trainings are provided, good practices swapped and community build.

5.4 Applications, admissions and enrolment
A range of students join the GS-LS Master's programmes: students from our 'own' bachelor degrees in biology, biomedical sciences, chemistry, pharmaceutics, psychology and artificial intelligence, and students from the University College; Dutch students from other universities and HBO institutions; students from abroad. The procedure of applications, admissions and enrolment ensures that the right student ends up in the right place as efficiently as possible without too much red tape or bureaucracy.

Application and admissions are components in the overall process of recruiting, selecting, and admitting students and of guiding them through the study and ensuring their successful graduation. The process is preceded by marketing, information activities and recruitment; enrolment and participation in the Master's programme. The process of application, admissions and enrolment is a complex one, involving many people whose roles are highly dependent upon one another. The aim is to maintain good communications so that the right student joins the right Master's degree in a process that is clear for all those involved. It must be clear what the deadlines are and how much time is required for the different stages of the process. Students must know where and how to enrol, how they will be assessed, when they can expect answers and what the following steps are.

The application, admissions and enrolment project (ATI)
Life Sciences participates in the Utrecht University ATI project for the ‘streamlining’ of the process for student applications, admissions and enrolment. This project is working on a clear process description, the optimalisation of the necessary technical facilities and on the improvement of internal and external communications.

The underlying assumptions for the design of the process are:
1. OSIRIS is the leading information system at Utrecht University for the ATI process;
2. not all documents and data that students are asked to supply can be in digital form; the process takes into account the fact that paper documents may be sent to the university;
3. the Utrecht University application software is Studielink.

Task distribution
With respect to the administrative activities conducted by Educational and Student Affairs (OSZ), a distinction is made between programmes supported by the OSZ of the Faculty of Medicine and the OSZ of the Faculty of Science.

Proper coordination between the administrative departments is safeguarded by monthly meetings of the heads of Educational and Student Affairs and degree coordinators.

Assessment & admissions
The Board of Admissions assesses students. This committee monitors the quality of the incoming students. The formal requirements are listed in the Education and Examinations Regulations (OER). Students in possession of a Dutch or foreign higher education diploma who can demonstrate that they have the knowledge, insight and skills in specific areas of the Life Sciences corresponding to at least the level of the Dutch university bachelor degrees in Biology, Biomedical Sciences, Chemistry or Pharmacy qualify for admission to the Master’s programmes in the Life Sciences.
All the programmes are international. That means that there are also explicit requirements relating to a mastery of English. For the various Life Sciences Master’s programmes, there are additional substantive requirements relating to the knowledge that students must have acquired in prior degrees. These requirements are directly related to the subject matter and the field covered by the Master’s programme.

Admission to the Master’s degree and the Master’s programmes is the responsibility of the Board of Admissions. The Board of Admissions comprises the degree directors of the Master’s degrees in Biomedical Sciences, Health Sciences and Neuroscience and Cognition, the degree directors from Chemistry, Biology, Pharmacy, two permanent secretaries and the chair of the Board of Examiners in an advisory capacity. The authority to act on behalf of the various Master’s programmes is linked to the faculty/department with formal responsibility for the Master’s programme in the following way:

- Biology of Disease  BMS
- Biomedical Image Sciences  BMS
- Cancer Genomics & Developmental Biology  BMS
- Epidemiology/Epidemiology Postgraduate  BMS
- Infection & Immunity  BMS
- Neuroscience and Cognition  BMS
- Toxicology & Environmental Health  BMS
- Regenerative Medicine and Technology  BMS
- Molecular and Cellular Life Sciences  CHEM
- Drug Innovation  PHARM
- Environmental Biology  BIO

The Board of Admissions has delegated the task of the content assessment of students to the Programme Committees. The Master’s coordinators play a central role in assessment in their capacity as Programme Committee secretaries. OSZ sends them the files of the students who have applied and they make records of the assessments of the Programme Committees. The final assessment is passed on to the secretary of the Board of Admissions for a final decision. OSZ then can proceed with the administrative processing.

Students are assessed on the basis of a letter stating their motives, references and grades; students are therefore assessed individually. In addition to the written documentation, the committee can arrange for an assessment of specific knowledge, insight and skills by experts or take action itself, for example by arranging an interview.

5.5 Educational learning process & didactics

5.5.1 A didactic approach to training researchers

The aim of the GS-LS Master’s programmes is to train researchers. All the programmes are research Master’s; they differ from other Master’s by the emphasis placed on conducting research independently. This is shown, for example, by the fact that 85% of the 120 EC points are earmarked for conducting research in two research projects, one lasting nine months and the other lasting six months, and for writing a literature study. The Master’s programmes should prepare students for PhD studies at the GS-LS or elsewhere. Currently, approximately 75% of the Master’s students move on to a PhD. That is why a didactic approach that specifically targets research is important.

5.5.2 Education at a research university

Utrecht University is a leading research university, and this emerges from its high position on a range of international rankings and the presence of renowned research groups and researchers. The university recog-...
will be from a Bachelor’s programme at Utrecht University; it will therefore be clear what background they have acquired. These students will also have a fairly good idea of the content of the various Master’s programmes. It can therefore be expected that they have been able to make a proper decision and that most of them will be studying a field that suits them. Students coming from other universities will be more varied in terms of prior knowledge, standard and expectations and they will also not be as familiar with Life Sciences. A large group of students entering the programmes will have hardly any experience, if any at all, with actual research. Some of them will also be surprised by the level of autonomy expected in Utrecht. Life Sciences wants all students who actually start on their research project to complete the degree. Therefore, Life Sciences aims to determine the initial circumstances of students entering the programmes in the first three months and to refer them elsewhere where this is appropriate (to another programme in Life Sciences, for example, to another profile, or to another degree). In the first few months of the degree, some of the students will also need some additional training, either in the field of knowledge and domain-specific skills, or in the area of more academic or general skills such as working autonomously, participating in group discussions, presentation, academic English or statistics. In conjunction with others, the course is developing School-wide facilities for this purpose.

5.5.6 The research cycle as the basic structure

The consensus at Life Sciences is that the development of students as part of the two-year Master’s should be primarily structured by the research cycle. The elements of the research cycle are:

- translating an observed problem into a concrete study question;
- reviewing existing research critically;
- drafting a theoretical framework;
- drafting a research plan;
- selecting techniques for application;
- explaining the plan;
- implementing the plan;
- analysing data;
- interpreting data;
- ongoing thinking about research;
- inviting, and dealing with, peer review;
- scientific reporting and presentation of results.

All these elements are covered in a structured way during the research projects. This has implications for the design and detailing of the research projects. Time is put aside specifically for reflection and feedback about the current phase of the student’s cycle. The evaluation covers not only substantive, but also process-related, progress. This is because the successful completion of the research cycle depends on the development of attitudes and personal assets such as ambition, autonomy, determination and creativity, communication about progress, results and problems. Because every student completes this cycle individually, a tailored individual approach is not a major problem. On the basis of the initial situation, expectations and the educational requirements of the student, the student and the supervisor can emphasise elements in the research cycle where the student still lacks the essential assets, or where the student wants to develop specifically. This means that supervisors must see the student’s learning process as central (rather than the intended research results).

In all the Master’s programmes, students spend most of their time on research. The degree of autonomy in the design and implementation of the research varies according to the programme and the domain. In all programmes, time is put aside explicitly at the onset of research projects for thinking about the specific research issue and approach. However, the opportunities that students actually have to formulate their own research issue and to investigate it vary according to the programme and depend primarily on the organisational and financial conditions. In a number of programmes, the research issues and methods are already determined at the outset to a large extent since this is the only way of achieving satisfactory results in a highly competitive environment. In that case, the development of students as autonomous researchers is the focus of additional attention in discussions with the supervisor.

5.5.7 Core courses and electives

Most Master’s programmes set aside 18 weeks for theoretical courses. Ten weeks are earmarked for the core courses that supply programme-specific knowledge. Most courses focus on knowledge development and not on the techniques required for research purposes (laboratory techniques and data-analysis techniques, for example). These skills are generally developed in the students’ research projects. A few programmes start with the knowledge and skills required before students can start their own research projects; other programmes allow students to start relatively quickly on their research project, with the knowledge being supplied ‘just-in-time’. Eight weeks can be used for personal study requirements. Needless to say, students’ opportunities to make decisions of their own will be limited when there are deficiencies to be made up.
with a PhD programme. There must be opportunities for the development of autonomy and confidence. This
the programme provides the opportunities required for this purpose. The nature of the programmes is relatively
coming scientific researchers in parallel with their professional and methodological development. The training
independently how to conduct high-quality scientific research in ‘the forefront of science’. The various degrees
programmes. Innovations often result from combinations where disciplines interact; contacts and exchanges
are therefore highly important in substantive terms. Plenary Life Sciences meetings will be discussing this issue
as a theme to an increasing extent so that students will acquire a better understanding of the wider research
field in which they are operating, the social context in which they are engaged, and of other questions and
techniques that may be valuable for their own domain.

5.5.10 Accountability
Life Sciences research not only involves fundamental scientific issues; it also interacts, directly or indirectly, with
society as a whole. How questions relating to health, illness, life and death are formulated and answered is an
issue that interests not only researchers but also patients, the public and politicians. Accountability for research
results and methods involves not only the academic world but also society as a whole. The communications
side (learning to write and present for a broader public as well) has been extensively developed in most
programmes. The ethical side is covered by a School-wide development plan.

5.6 Study counselling and monitoring
5.6.1 Study counselling, vision and goal
The Utrecht University GS-LS provides a study counselling system that is appropriate for the goals of the
curriculum. By comparison with a bachelor degree, the entire curriculum is now geared towards learning
independently how to conduct high-quality scientific research in ‘the forefront of science’. The various degrees
delivered by the GS-LS provide the programme framework required for that purpose. Curriculum topics and
working methods have been selected so that students are challenged to develop their autonomy as up-and-
coming scientific researchers in parallel with their professional and methodological development. The training
programme provides the opportunities required for this purpose. The nature of the programmes is relatively
open, they include a considerable degree of freedom/ flexibility and they are based directly on the realities of
research as much as possible. The study counselling arrangements move forward along the same road.

The dominant philosophy is that students are seen as trainee academics who, in principle, wish to continue
with a PhD programme. There must be opportunities for the development of autonomy and confidence. This
means that students are no longer guided; they must learn themselves to ask for additional information and support when they feel this is needed. The emphasis is on supervision by the research staff at the departments and institutes as this is the location for scientific training in conjunction with training as an ‘academic’ and specialist in a specific domain of expertise. This is the first line from which a number of common problems relating to the substance of assignments, collaboration within the team, the problems generated by the research etc. are discussed and resolved in consultations between the study supervisor and the student.

The second line relates to the support provided by the programme coordinator. The latter often has a much clearer picture of the overall structure of the programme, of the demands placed by the programme on the student’s learning abilities, and of the problems that students can run up against with certain topics, areas or teachers. So the programme coordinator is the person in the best position to provide students with support relating to their planning and approach. The search for solutions for all sorts of substantive problems relating to admissions will also devolve to the programme coordinator. The coordinator will refer students to the third line of academic counsellors for problems not restricted to a single programme that are more procedural or personal in nature. Examples may be technical problems relating to enrolment or personal problems such as motivation, study selection problems, identity problems, conflicts etc. Here, the coordinator will refer the student to specialist advisors at the University or outside the universities such as the Student Service Centre, the student counsellors and psychologists, and the Centre for Teaching and Learning.

The aim of this system is to enable GS-LS students to complete the training successfully within two years and to
fulfil the learning objectives for the Master’s, to help them to make the right decisions to achieve that aim and to plan their study in the right way. Counselling must therefore be tailored to the requirements of individual students. Students may, at their own initiative, turn to any of the tutors listed and, if this is desirable, consult an academic counsellor directly. Students with personal problems that affect the progress of their study can count on extra support in that area. The quality of counselling in the three lines is safeguarded by a quality control system. The GS-LS wants as many students as possible to graduate within two years. We also want those students to be ready for the world of work and to look back on their student years with pleasure.

Study counselling processes
The curriculum includes, broadly speaking, three processes in which counselling plays a role, each of which has a specific objective:
1. Study selection process: ensuring that the right student ends up in the right place.
2. Learning process: providing tools for the optimisation of the learning process.
3. Personal development process: supporting the well-being of individual students to encourage study progress.

5.6.2 Study selection process
Students should receive counselling as they are selecting their studies so that the right student ends up in the
right place. From their point of view, it is important for students to be able to follow their interests as far as possible and to maximise their development. They must be able to become researchers who have the right professional and academic competences. In that way, they will be well-prepared for a research career and, at the same time, acquire a number of elementary general competences. From the point of view of the degree, students who feel at home in a programme will be motivated to complete the programme within a reasonable amount of time and to deliver good work. Motivated students are assets for research groups and other institutes, and they also make up a pool of potential PhD candidates.
The key role with respect to choices made in a Master’s programme is reserved for the programme coordinator, who is responsible for the correct information about the content of the programme. That information is passed on through e-mail and in personal interviews upon which the students can base their decisions. It is also passed on through contacts and information resources such as the Utrecht University website for potential students, brochures and information activities. The programme coordinators are involved directly or indirectly in all these activities.

There are coordinator meetings at the GS-LS every two months at which the agenda includes the coordination of student guidance matters.

Students faced with career decisions such as: what do I want to do with this degree, what do I want to do later and is that possible etc. can follow the Career Planning and Professionalisation course. This course offers an individual approach and intensive feedback so that students can establish a picture of what they themselves want and can do, and so that they can put a study/career action plan into practice.

Utrecht University monitors satisfaction with the choice of study on an annual basis. The university student monitor for 2006 showed that most students (74%) at the GS-LS would select the same Master’s programme again and that the average mark they give to their programme is 7.73 (out of 10).

Evaluations are conducted to establish any areas of dissatisfaction and to analyse the causes.

5.6.3 Learning process

During the Master’s programme, students acquire both knowledge and practical and academic skills. The learning objectives set out the knowledge and skills that students are required to have upon completion of the programme. Students must be able to achieve the learning objectives within two years by following an achievable study programme and with sound counselling. Counselling during the programme is provided by teaching staff/supervisors and it is geared to supporting the student learning process. Both the quantity and the quality of the counselling play a role here. Teaching staff must comply with specific quality requirements (teaching staff with relevant responsibility are required to have at least a basic teaching qualification) and students may require a minimum number of contact hours. Counselling during research projects is important. Research projects are new study components for students during which they can acquire a very large number of different skills. The research projects make up most of the curriculum. Counselling is individualised and extends over a long period of time (6-9 months). Students who have problems with general study skills and who are unable to obtain adequate assistance from the supervisor/teacher may, after consultation with the study councillor, receive training from the COL.

Life Sciences wants its students to be content and it monitors study counselling on a regular basis. Recent traineeship evaluations of the BMS programmes and Biology looking at academic counselling shows that many students are satisfied (average rating of 4.0 on a five-point scale). A Utrecht University student monitor has also shown that a large majority are satisfied or very satisfied with the intensity and quality of supervision. The GS-LS has also booked better scores for satisfaction with research and thesis counselling than the university on average.

There is a research project manual for students and supervisors.

Applications from GS-LS students for research projects and theses are accompanied by a contract that includes agreements between the students and the counsellor about counselling. All the agreements include evaluation interviews that focus explicitly on the learning process. The assessment criteria are also discussed explicitly.

Generally, PhD students supervise Master’s students during research projects. They are given the opportunity to follow the ‘Effective student counselling’ course. Counselling skills play a prominent role in BKO and SKO arrangements for permanent staff. A course in interview skills is given to counsellors required to conduct mandatory evaluation interviews.

A number of study-skill problems recur frequently in the student population. For example, there can be problems with writing and presentation skills, as well as academic studying and time management. Academic counsellors can quickly identify these types of problems and refer students to the COL for training. Students can also get in touch with the COL at their own initiative. These courses are subsidised by the university and the enrolment fees, which students are required to pay themselves, are modest. Life Sciences is in favour of courses in English for international students.

5.6.4 Personal development process

Students can have problems (personal or otherwise) that interfere with study progress. Examples are problems relating to disability, psychological problems and other problems of a personal nature. The first person to whom these students should turn is generally the academic counsellor. Particularly because academic counsellors have a confidential position, students see them as ‘safe’ people with whom to discuss what are often sensitive matters. Personal counselling should be geared to providing students with the tools that they
need to tackle the problems themselves. Academic counsellors must be able to talk to the Board of Examiners in confidence when there are study problems related to a student's personal circumstances. In some cases, the academic counsellor will refer students to the Student Service. There are a range of university arrangements that cover, for example, studying with a disability, financial problems and psychological counselling. Experts and contact persons in this area are the study counsellors and psychologists of the Student Service Centre.

The GS-LS has four experienced and committed academic counsellors who meet frequently and seek to coordinate their work. Utrecht University supports the professional development of academic counsellors and provides regular relevant courses.

5.6.5 Organisation
There are various people/bodies involved in student counselling or supervising. At the university level, there is the Centre for teaching and learning and the Student Service Centre (psychologists and student counsellors). At the GS-LS, there are the teaching staff/supervisors, programme coordinators and academic counsellors. Supervisors can be broken down into four categories:

1. Those employed at the GS-LS.
2. Those employed outside the GS-LS but at Utrecht University.
3. Those employed outside Utrecht University at another university.
4. Those employed outside Utrecht University and not at another university.

At the GS-LS, a second reviewer from category 1 is mandatory in situations 3 and 4.

Internal communications and coordination are very important and they are organised in broad terms on the basis of the following task distribution:

- Research project supervisors help, for example, with the design and implementation of research, the timetable, social relationships in the research group, and the written and oral presentations.
- Programme coordinators help, for example, with the process of study selection in the programme relating to courses, research projects, career prospects; the components/timetable of the individual study programme; and the contacts with research groups/supervisors.
- Academic counsellors provide counselling relating to, for example, the process of study selection in general, problems with supervisors/study skills of a general nature, personal problems, including conflicts with supervisors, and problems relating to organisational matters. They mediate with the Board of Examiners when there are personal problems.
- Specific counselling relating to general study skills such as writing and planning is available from the COL. The GS-LS itself does not provide counselling of this kind.

The monitoring of steady progress and the quality of the academic counselling are components of the School-wide quality control processes. The current system is compared during the course of the quality-control cycle with academic counselling at accredited international Graduate Schools.

There is a GS-LS complaints coordinator at the professorship level to whom students can turn if, despite all the other counselling arrangements, they are dissatisfied.

5.7 Quality control and accreditation

5.7.1 Basic principles for internal and external quality control
One of the main tasks of the GS-LS is quality control and quality monitoring of all its Master’s programmes. At Life Sciences, the BoS has the ultimate responsibility for quality. Regarding external quality requirements, Life Sciences focuses on the accreditation framework for Master’s degrees established by the NVAO. In addition, the BoS ensures that the School’s curriculum complies with the internal quality requirements based on the educational vision formulated at the School level.

Quality control at the School can be considered to be adequate if it results in the School working as a ‘learning organisation’, where a deficiency in quality (problems relating to compliance with given internal or external requirements) are reported, analysed and resolved in good time using the Plan-Do-Check-Act cycle:

1. Plan: formulating goals and measures
2. Do: implementation of the measures
3. Check: monitoring the results (measurement and evaluation)
4. Act: where needed, new action / other measures

This is primarily a matter of initiating and maintaining the momentum of a process of ongoing improvement based on the efforts of all parties engaged in the curriculum: programme coordinators, teaching staff, educational committee, Board of Examiners and the staff of educational and student affairs (OSZ). The involvement and commitment of students are indispensable here.

Quality control at the School is not an autonomous system; it is part of an overarching quality control system that covers several levels:

<table>
<thead>
<tr>
<th>Level</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Utrecht University</td>
<td>Provides the general framework, the Bachelor and Master structure, the regulatory frameworks such as the Education and Examinations Regulations (OER), the administrative structure, representative arrangements, etc.</td>
</tr>
<tr>
<td>2 Faculties: Science, Medicine &amp; Veterinary Medicine</td>
<td>General resource allocation, the allocation of authority, the allocation of tasks, the logistical infrastructure, support, the human resources policy, ITC, etc.</td>
</tr>
<tr>
<td>3 Graduate School of Life Sciences</td>
<td>Develops programmes that meet all internal and external quality requirements, creates the conditions required for that purpose at the School level, monitors targets, subject matter, curriculum arrangements etc. to ensure that they comply with the agreed criteria and standards.</td>
</tr>
<tr>
<td>4 Programme</td>
<td>Delivers the curriculum resulting in the achievement of the learning objectives for each programme and in the general objectives. Ensures that the programme components (courses, research projects, etc.) comply with the stated requirements.</td>
</tr>
</tbody>
</table>

The cycle of improvement is completed at each of the levels referred to above. The different cycles are also interlinked. In other words the conditions are created at the higher level to ensure improvements in quality at the next level down.
5.7.2 Quality control system at GS-LS
The School ensures that the programmes can implement their core task of providing education in a specific focus area as well as possible. The School evaluates the programmes and provides the programme management with information about programme performance, the results achieved by students in those programmes, and the effectiveness of certain working methods etc. The results can then be used to analyse problems and make improvements, with the School again providing support. The quality control system as a whole is described in the Schools quality control plan (2010).

The data collected at the School level include at least the figures relating to students entering and leaving the programmes, returns and delays in study completion.

The GS-LS wishes to ensure that the programmes do actually train the top researchers who can go to work throughout the world, as required by the School’s mission. For this all learning goals as set by the School have to be met by all students. The Board of examiners plays a specific role in assessing the quality of all examinations. An important element is that two-thirds of the Master’s programmes consist of research projects. Monitoring the quality of those research projects is an important focus of attention at the GS-LS. The programme coordinator is an important link in this system because he or she is active at the heart of the research field. Therefore he/she cooperates in assessment of these projects with the board of examiners.

A second important principle is that ‘good education’ is entirely dependent on ‘good teachers’. The professionalisation of teaching staff is safeguarded by university policy. This policy means that faculties monitor the academic staff with teaching responsibilities to ensure that they have the appropriate teaching qualifications (BKO or SKO). The day-to-day supervision of research projects is generally the responsibility of PhD students who will not yet have teaching qualifications of this kind. They can follow a short course: ‘Supervising and assessing research project students’. The GS-LS ensures that all teaching staff with responsibility do actually have the BKO or SKO qualifications or that they are working - in so far as they do not yet have these qualifications - on acquiring them. External teaching staff and research project supervisors are expected to operate at the same level of competence and their own institution is expected to provide them with the appropriate facilities.

A third principle relates to support for programmes when actually implementing improvements after problems have been identified. A standard procedure has been developed for this purpose and it has been applied ‘Life Sciences-wide’ since the 2007-2008 academic year. This procedure involves the educational committee submitting a request, on the basis of survey results, through the BoS to the teacher responsible for an improvement plan. A concise summary of all evaluation results is maintained in a chart so that it is easy to look back at results achieved in the past. If there is no sound improvement plan, or if there is no improvement in subsequent years, the educational committee will inform the BoS accordingly and the latter will take steps.

5.7.3 Supplementary facilities and measures
The educational committee of the Graduate School of Life Sciences plays a crucial role in appraising, and advising about, quality control. As pointed out in Chapter 4.1, all official recommendations emanate from the Life Sciences educational committee. To enhance the profile and accessibility of the Life Sciences educational committee and to improve the dialogue with the programmes, teacher and student meetings are organised regularly. In the future, these meetings will be organised for each programme in order to allow for discussions about programme-specific issues.

The course evaluations will be worked out for each programme and discussed by the programme committee. The programme coordinator plays an important role in the evaluation of the quality of individual research projects. The coordinator gets a general picture from the anonymous surveys but also has individual contacts with students. He/she can talk to individual students, and also with counsellors in consultation with the students. In addition, the programme coordinator can inform the programme committee if the assessment of a research project proves unsatisfactory. The assessment system itself and the ongoing standardisation of that system, particularly in terms of research projects and theses, are priorities for the Board of Examiners. Students are particularly appreciative of fast and full feedback about the assessment of their performance. This is a responsibility for individual course teachers and research project supervisors. The programme coordinator ensures that students receive substantive feedback in good time.

Life Sciences gives students the opportunity to organise Master’s representation, with participation being possible for at least one student from each programme. It is preferable for the same person (i.e. the student representative) to be a member of both the educational committee and the BoS.

5.8 The match between the curriculum and the labour market
The GS-LS wants its students to acquire the assets that will enable them to find appropriate employment, first of all as researchers in the relevant field. The GS-LS also wants its students to be able to qualify for other jobs that are not strictly scientific, such as policy officers, managers etc. in areas where the skills and expertise they have acquired can be useful in different ways. The emphasis here is on future careers that are primarily based on training as researchers. However, we also wish to train researchers so that they are capable of operating in other environments. This has immediate importance for the students who are looking to pursue a career outside the research world after their PhD.

5.8.1 The GS-LS competence targets
The competences that students are expected to acquire can be seen in the goals for the Life Sciences curriculum as a whole and in the learning objectives for each programme. The general objectives indicate that all the programmes hope to produce graduates who can participate actively in scientific development as researchers, scientists and academics. This means: acquiring new knowledge of the field, applying that knowledge in research, developing research to acquire new knowledge, disseminating new knowledge (both among fellow professionals and the general public), explaining findings by means of clear reports, critical thinking about acquired knowledge, etc.

The learning objectives of Life Sciences were drafted in accordance with the Dublin descriptors. This means that the international comparison of competences is safeguarded in five respects: knowledge & understanding, application of knowledge & understanding, judgement, communications and learning skills, with the own field of expertise as the substantive frame of reference.

The ability to use knowledge actively, for example to acquire new knowledge, is intricately linked with the role of a researcher. This is therefore the first and most important role that students must learn. They do this by acquiring professional knowledge, methodological knowledge, statistical knowledge etc. in – and on the basis of – the researcher role, and this often involves a strong social component.

The result is that students in a given field learn to think and act as researchers, formulating hypotheses, asking questions, collecting facts, making analyses, reporting etc. During that process, they often have role models: their own supervisor or other researchers working alongside them. They develop certain scientific attitudes...
such as: accuracy, meticulousness, responsibility, clarity, focus on the 'truth' etc. They also acquire certain
communications skills, such as the ability to work together as part of a team, to proceed in a result-minded
way, etc.

These competences are also very important in other professions: consultants, managers, policy officers, press
officers or publicists also need to be meticulous, precise and result-minded, and to have team skills. These
‘overlapping’ general competences therefore constitute – on the basis of the core research role – interfaces
with other professional roles. These interfaces mean that graduates are, in principle, able to move on to other
professions and so there is a basis for broader career prospects and more wide-ranging careers.

With this objective in mind, the GS-LS wants to train ‘researchers plus’, in other words researchers who have
developed the capacity to use their expertise and skills in several professional contexts. This is important for the
advancement and application of knowledge, for example in applied research, product development and
innovation, allowing graduates’ knowledge to move into other sectors and professions. At the same time, it
allows graduates to move forward into the varied careers required in the flexible, open labour organisations of
today. A range of surveys of past graduates (including those who have gone on to PhD studies) and their
employers in the field of the exact sciences have shown that these ‘researchers plus’ are more than welcome
on the employment market.

5.8.2 Alumni policy
Life Sciences has not yet conducted its own survey of its former graduates (alumni). Surveys of comparable
graduates show that the majority of graduates from Biomedical Sciences (80%), Chemistry (particularly
Biochemistry and Organic Chemistry) and Biology (70%) are initially employed in research positions. At first,
universities are the main employers. After approximately three years, graduates start to move on to other
positions. During this second phase (after 2-3 years) graduates (with the exception of PhD students) move into
professions such as consultancy, policy, civil service, management, communications, ICT, PR and scientific
journalism.

Employer satisfaction with graduates seems to be primarily related to the ability of past graduates to take on
several tasks in a team, whether or not as a researcher, sometimes with the emphasis on research but
sometimes focusing on coordination, or policy consultancy, or management. Both employers and past
graduates consider having the ‘right professional knowledge’ to be indispensable. For them, it goes without
saying that this knowledge must be present. The basis in this respect must be established during training. Both
parties think that it must be possible to further develop professional knowledge in and through the work.
Satisfaction among alumni about the training they have received would seem to be primarily linked to the
degree to which they themselves feel that they are capable of fulfilling the various professional roles and the
degree to which they are able to switch smoothly from one professional role to another. This would appear to
benefit career prospects within an organisation. The following are listed as the important research compe-
tences: the ability to design and implement academic and applied research, statistical and laboratory skills,
strong expertise in the areas of methodology and statistics, an ‘analytical mindset’ etc. These competences are also very important in other professions: consultants, managers, policy officers, press
officers or publicists also need to be meticulous, precise and result-minded, and to have team skills. These
‘overlapping’ general competences therefore constitute – on the basis of the core research role – interfaces
with other professional roles. These interfaces mean that graduates are, in principle, able to move on to other
professions and so there is a basis for broader career prospects and more wide-ranging careers.

Life Sciences extrapolates these findings to its own programmes. This means that students have to work in
breadth and in depth and that they are given the opportunity during their programme, in the researcher role,
to acquire experience with, or in, a range of other professional roles.

In the near future, a Curriculum-Employment Market Advisory Council for the whole Graduate School of Life
Sciences will be established to allow future employers and programme directors to discuss the match between
the curriculum and employment requirements, new developments in the profession, openings for ‘R&D
internships’ in companies for students, the competences that employees feel graduates lack etc. This advisory
council will issue recommendations every two years.

There will be regular surveys of the subsequent careers of Life Sciences graduates and of their employers,
focusing particularly on the graduates’ careers and the competences that they and their employers acquire and
that they feel are lacking. The surveys will identify the sectors, fields or professions where graduates are
employed after completing their education (MSc, PhD). They will look at graduate and employee satisfaction
with the match between training and employment, determining possible knowledge and competence
deficiencies. The possible consequences for Master’s and PhD education will be raised by the BoS in the
Advisory Council referred to here, in the educational committee and in the various programme committees.
Sources consulted for the training plan of Utrecht University, Graduate School of Life Sciences

The text above is based on information from sources and consultations with people from the GS-LS.

People consulted:
- Internationalisation staff of the UMC, BMS, Research & Education, and the Faculty of Science.
- Communications staff of the Utrecht UMC and the Faculty of Science.
- Chair of the GS-LS Board of Studies
- Secretary of the GS-LS Board of Studies
- Project team ATI 3
- Programme coordinators
- Degree coordinators
- Academic counsellors
- Research project supervisors
- Members of the educational committee
- Members of the Board of Examiners
- GS-LS policy staff
- GS-LS students

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