Master Research Project

Guide for <u>students</u>

Utrecht University

Graduate School of Life Sciences

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Summary (Quick guide)

Please note the Quick Guide is originally intended for supervisors and therefore addresses them. However it also provides a good overview for you as a student.

The main part of the training of Master's students within the Graduate School of Life Sciences (GSLS) at Utrecht University (UU) consists of one or two research projects. The Graduate School of Life Sciences maintains a high standard of education. With many research projects being supervised both inside and outside the UU and UMC Utrecht, the uniform assessment of these projects is a major challenge. Although the majority of the non-UU/UMCU projects are carried out at renowned and excellent research groups, each institute / country has its own standards when it comes to assessing student research projects. In order to ensure a uniform and high standard of education, including assessment, we hereby provide a guideline for supervision and assessment of the research projects performed by GSLS students.

Start of research project

The student can only start his/her research project after:

- (s)he and his/her supervisors have received an email from the Research Project Coordinator, confirming the approval of the Board of Examiners (BoE).
- The student is responsible for arranging his/her own visa, accommodation, insurance and financial support, however your help as a supervisor is appreciated.

Supervision terminology and responsibilities

The Examiner:

- has final responsibility for the grade of the research project.
- is affiliated to Utrecht University or UMC Utrecht as a full, associate (UHD) or assistant (UD) professor with a tenured position. Professors on a UU/UMCU special chair (bijzonder hoogleraar), but in daily life affiliated to a non-UU/UMCU institute, can also act as examiner.
- Post-docs, PhD candidates, and professors not affiliated to UU / UMCU **cannot** act as examiner.
- In case of a project inside UU/UMCU, the UU/UMCU examiner will grade the research skills, written report and final presentation and (s)he determines the final mark in close consultation with the daily supervisor and the second reviewer.
- In case of a project outside UU/UMCU, the UU/UMCU examiner will grade the written report and final presentation[1] and (s)he determines the final mark in close consultation with the supervisor host institute. We ask you to stay in touch with the student at least once every two months.

The Daily supervisor (in case of a project at UU/UMC)

- is responsible for the daily supervision of the MSc student during his/her project.
- works at the institute where the project is carried out.
- does not grade the research skills, written report and presentation him/herself, but will advise the examiner on the grades.
- must be sufficiently capable of supervising an MSc student. If a the daily supervisor is still rather junior (e.g. PhD candidate or postdoc) (s)he must be supported by a senior scientist (e.g. his/her own supervisor).

The Supervisor host institute (in case of a project outside UU/UMCU):

- is responsible for the daily supervision of the MSc student during his/her project.
- works at the institute where the project is carried out.
- grades the research skills, written report and presentation.
- must be sufficiently capable of supervising a MSc student. If a the (daily) supervisor at the host institute is still rather junior (e.g. PhD candidate or postdoc) (s)he must be supported by a senior scientist / staff member (e.g. his/her own supervisor).

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[1] *In case of a research project outside UU/UMCU the final oral presentation should therefore be given both at the host institute and in the group of the UU/UMCU examiner.*

<u>The Second reviewer</u>:
- should only be appointed for projects <u>inside</u> UU/UMCU. For projects outside UU/UMCU both examiner and supervisor host institute grade the report and presentation, therefore a second reviewer is not required.
- is a senior scientist (not a PhD candidate or postdoc) who is **not** directly involved in the research performed. Ideally, a second reviewer is a staff member from a different group than the examiner.
- Evaluation of the research report and final oral presentation by a second reviewer is mandatory.

Length of the project and extension
- The final presentation and the final written report must be delivered within three months of the end of the defined research project period.
- Research projects can be extended with 6, 9 or 12 credits from the elective component.
- The student should apply for this extension before the start of his/her research project. This can be pointed out on the application form.
- After the research project has already started, it can only be extended with the elective component as an exception. In this case the student should apply for the extension, well before the start of the extension, by handing in a letter to the Board of Examiners with a formal request and signed by examiner, programme coordinator and student.

Contents of the research project
- A research project consists of several key stages: drawing up a timetable, reviewing literature, drawing up a research plan, carrying out experiments / collecting data, data analysis, writing the report and presenting orally.
- Participation in group meetings and other group activities are part of the research project.
- Reports should be written in English and contain a summary specifically aimed at informing the general audience about the content of the research project (laymen's summary – in Dutch or English, 500 words, the target audience is able to understand Biology at high school level).
- All students have to present their work orally (in English) to the research group of their examiner at Utrecht University / UMCU (and, if applicable, also at the external host institute).
- *For more information about the content of the research projects please read chapter 4 of the [Master Research Project Guide for supervisors](#).*

Interim assessment (feedback during project)
- A mandatory evaluation meeting between student and examiner, and preferably also the daily supervisor, should take place two or three months after the start of the research project. <u>Please note</u>: this interim assessment conversation is different from regular work discussions.
- In case of a research project <u>outside</u> UU/UMCU the interim assessment meeting is between the supervisor host institute and the student. The examiner must be informed about the outcome of this meeting (e.g. by sending a copy of the signed report via e-mail).
- During the evaluation meetings the student receives feedback on his/her work, progress and performance. We strongly advise you to use [Rubric about research skills](#) as a tool to discuss the applicable strong points and points of improvement of the student.
- Afterwards the student has to either hand in the highlighted rubric or write a short report (½ A4) summarizing for which criteria (s)he is on the right track, and which parts need more attention. (S)he can use [this form](#) to write his/her report.
- The highlighted rubric or report has to be signed by the examiner (project inside UU/UMCU) or the supervisor host institute (project outside UU/UMCU).
- It is important to evaluate the work and progress of the student on a regular basis. Evaluation meetings can be scheduled more often, if preferred.
- *For more information about the supervision of the research projects please read chapter 5 of the [Master Research Project Guide for supervisors](#).*

Fraud and plagiarism

Fraud or plagiarism is absolutely not allowed and will be dealt with as described in the Education- and Examination Regulations. The examiner:

- has the responsibility to ensure that no fraud or plagiarism took place. When you find or suspect that your student is committing fraud or is plagiarizing during his/her research project, this must be reported to the Board of Examiners (BoE). You are invited to contact the BoE first for advice: more information on how to deal with plagiarism or fraud.
- should check the final research reports for plagiarism using Ephorus, or an alternative comparable plagiarism checker.
- When the reported percentage of plagiarism in Ephorus is >10%, but there is no case of plagiarism, a motivation written by the examiner explaining this should accompany the assessment form. The student may only submit the assessment form of the research project if the summary of the Ephorus plagiarism check is attached to the assessment form.

Final assessment

At the end of a research project, the student is expected to have met the learning outcomes. In order to assess whether the student has achieved these learning outcomes we strongly advise you to use the Rubrics for research skills (60% of final grade), report (30%) and presentation (10%).

In case of an project inside UU/UMCU, the assessment is performed by the examiner in close consultation with the daily supervisor and a second, independent reviewer (see 'Supervision terminology and responsibilities').

In case of a project outside UU/UMCU, the supervisor host institute[2] grades all three components. The examiner and supervisor host institute should contact each other in order to make sure that the assessment of all components are performed according to the guidelines of the GSLS-UU.

- First, the supervisor host institute determines the grades according to his/her own marking system (e.g. Anglo/Saxon marking (F-A$^+$)).
- Next, the supervisor host institute consults the UU/UMCU examiner. The examiner converts the grade according to the Dutch marking system. The conversion table is available here.

If the examiners and second reviewers or host supervisors marks differ by 2 or more points, the Board of Examiners should be notified by the examiner.

Completion of the research project

- The student will give a copy of the report to his/her examiner and second reviewer or supervisor host institute.
- The examiner and second reviewer must complete the assessment within 10 working days after the student has handed in his/her (final) report and gave his/her oral presentation, by filling in and signing the assessment form. To make sure there are no delays, make agreements with your student beforehand about the dates for handing in his/her final report / presentation.
- The student should deliver the following to the Administration Office as soon as possible:
    - signed assessment form, including the attached evaluation form;
    - summary of the Ephorus plagiarism check, provided by his/her examiner (if percentage is >10% a written motivation from examiner should also be included);
    - written motivation for the final grade from and signed by the examiner (for **all** grades, not just ≤ 6 or ≥ 8.5);
    - PDF file of the report (via email to the Administration office).

Problems or questions and further information

In case of any problems or questions, contact the programme coordinator first, or otherwise the academic counsellor or research project coordinator.

All official regulations of the GSLS are recorded in the Education and Examination Regulations, the Rules and Regulations and the Student's Charter, which can be found here. In our Study Guide Life Sciences guides are available about research projects as well as writing assignments and for both students as well as for supervisors.

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[2] *If the supervisor host institute is still rather junior (PhD candidate or postdoc), (s)he must be supported by a senior scientist (e.g. his/her own supervisor).*

Communication

This guide is intended for students undertaking a research project as part of their Master's programme in the Graduate School of Life Sciences of Utrecht University. Both students and supervisors have expressed a desire for better information and guidelines with regard to research project supervision and progress. A corresponding guide has been drawn up for supervisors as well.

The purpose of this guide is to give a helping hand and guide, referring you to further sources for more information or support. All official regulations are recorded in the Education and Examination Regulations, which can be found on the website of the Graduate School of Life Sciences. The rules and guidelines may be subject to (interim) changes. The latest version of this guide is always available on the study guide of the Graduate School of Life Sciences.

This guide has been compiled with the utmost care, but is for informational purposes only and no rights can be derived from its contents. If there are any inaccuracies please inform one of the editors, Kirsten Boersma-van Nierop or Els van der Vlist.

Chapter 1. Scientific integrity and conduct

When undertaking a research project as a Master's student, you enter the world of scientific research, which comes with its own code of conduct, based on principles of proper scientific behaviour. This chapter deals with some of the aspects of scientific integrity. When carrying out a research project bear in mind these principles, which apply also to you as a master's student.

1.1   Scientific integrity[3]

Science is knowledge obtained through observation and experimentation, study and thinking. Scientific research is carried out to determine the nature and principles of what is being studied. It depends on arguments and evidence, i.e. observations of nature or of humans and their actions and products. In general researchers, research institutes and universities commit themselves to observe and to promote the principles of scientific integrity.
Both the definition of scientific misconduct and the specification for proper scientific practice are based upon principles of scientific integrity. These are principles that all scientific and scholarly researchers and practitioners should observe individually, among each other and toward the outside world. These principles include the following:
- *Honesty* in presenting research goals and intentions, in precise and nuanced reporting on research methods and procedures, and in conveying valid interpretations and justifiable claims with respect to possible applications of research results.
- *Reliability* in performing research (meticulous, careful and attentive to detail), and in communication of the results (fair and full and unbiased reporting).
- *Objectivity:* interpretations and conclusions must be founded on facts and data capable of proof and secondary review; there should be transparency in the collection, analysis and interpretation of data, and verifiability of the scientific reasoning.
- *Impartiality* and *independence* from commissioning or interested parties, from ideological or political pressure groups, and from economic or financial interests.
- *Open communication,* in discussing the work with other scientists, in contributing to public knowledge through publication of the findings, in honest communication to the general public. This openness presupposes a proper storage and availability of data, and accessibility for interested colleagues.
- *Duty of care* for participants in and the subjects of research, be they human beings, animals, the environment or cultural objects. Research on human subjects and animals should always rest on the principles of respect and duty of care.
- *Fairness,* in providing proper references and giving due credits to the work of others, in treating colleagues with integrity and honesty,
- *Responsibility for future science generations.* The education of young scientists and scholars requires binding standards for mentorship and supervision.

1.2   Scientific misconduct

Violating these basic norms leads to research misconduct, which is the crux of inappropriate behaviour in science. Research misconduct is damaging to science, because it may create false leads for other scientists or the results may not be replicable, resulting in a continuation of the deception. It is also harmful to individuals and society: fraudulent research may result in the release and use of unsafe drugs, in the production of deficient products, inadequate instruments or erroneous procedures. Furthermore, if policy or legislation is based on the results of fraudulent research, harmful consequences are not inconceivable. But damage is also done through the subversion of the public's *trust in science*. The credibility of science would decline and trust in science as a dependable source of information and advice in respect of numerous decisions, so important for the welfare of mankind and society (environment, health, security, energy), would be subverted. This could lead to undesirable restrictions on permissible research, which could further damage the pursuit of knowledge.

The top three serious violations are:

- *Fabrication,* making up results and recording or reporting them.
- *Falsification,* manipulating research processes or changing or omitting data.

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[3] Paragraph 1.1 and 1.2, text derived from: A European Code of Conduct for Research Integrity, Pieter J.D. Drenth, 2010.

- *Plagiarism,* the appropriation of another person's ideas, research results or words without giving appropriate credit.

1.3   Fraud and plagiarism regulations

Utrecht University takes fraud and plagiarism very seriously. It will not be tolerated if you fake responses from questionnaires or research data, or include data or sections of text from others in a research project report without quoting the source. All reports will be scanned by your examiner for plagiarism by the plagiarism-detection programme Ephorus. Those (co-) committing fraud or plagiarism will be punished by the sanctions described in the Education- and Examination Regulations, varying from invalidation of a paper and a record in OSIRIS to permanent termination of registration to the programme. Furthermore no Cum Laude classification can be obtained.

1.4   Copyrights and publication

When gathering data and writing a research report, you always do so under supervision and usually within a framework of a larger research project. In that sense you are not the sole owner of the data and ideas in your project.
At the start of your project it is therefore important to set agreements with your examiner/supervisor on the publication of the work you do. Usually publication rights will be transferred to your supervisor/research group.
As to copyrights (*auteursrecht*), by signing the application form the student declares to transfer the copyright of any and all products, including the tangible and intellectual products, of the research project to Utrecht University, the University Medical Centre Utrecht (UMC Utrecht) or the host institute. The rights of the student by scientific standards to be a co-author of publications or to be otherwise acknowledged are still recognized. Your contribution may be acknowledged in different ways. Not only does this depend on the amount of data/texts, but it also depends on the quality of your work and the level of independence during the project. You may be named in the acknowledgments, your report/writing assignment may be used as a literature reference or you may be asked to be a co-author for an article.
Any questions regarding these issues should be addressed to the head of your group.

Chapter 2. Rules and guidelines for the research project

The main part of your training as a student of Utrecht University, Graduate School of Life Sciences (GSLS) is formed by the two research projects. Research projects are individual projects which can be conducted in any topic within the Life Sciences, but must be linked to the student's Master's programme. They are carried out under the supervision of staff members of Utrecht University, the UMC Utrecht or an affiliated institute. Research projects may include fundamental or clinical based research. In case of research projects within the management-, communication & education- or drug regulatory sciences-profile, topics are based on policy, management, education, or communication. Before the start of the project, it has to be approved by your programme coordinator and the Board of Examiners.

2.1   Rules governing research projects, learning outcomes

The research projects of the GSLS Master's programmes are governed by a number of rules and guidelines. All official regulations are recorded in the Education and Examination Regulations, the Rules and Regulations of the Board of Examiners and the Student's Charter. The rules and guidelines may be subject to (interim) changes. The latest version of the Education and Examination Regulations, the Rules and Regulations, the Student's Charter and this guide is always available on the study guide of the GSLS.

The main purpose of the research project is to teach the student how to perform research independently, taking the complete research cycle into account. To achieve this, the Board of Examiners of the GSLS has defined learning outcomes that should be achieved by carrying out the research project (see paragraphs 4.4 and 4.5). As well as having sufficient knowledge and practical skills, students are also expected to have acquired specific skills such as working independently and presenting, analysing and interpreting data.

The supervisor's role is to supervise the student in developing the above mentioned academic skills, both professionally and mentally. The supervisor is responsible for proposing a project that is of a sufficient level and that enables the student to achieve the above mentioned aims and objectives. The student is responsible for the actual learning process. Students undertaking a research project *are entitled to approx. 5% supervision time*. In other words: in a standard working week of 40 hours, the student can expect to receive at least 2 hours of supervision (per week). This supervision figure is an indication only.

The amount of time available to finish the project (including writing of the report) should be kept in mind, and a deadline must be set by which the research project should be finished. The research project is divided into 40-hour working weeks. Official public holidays count as free days. The number of days taken as holiday must be added to the agreed research project duration. The same applies to days taken off form the project to participate in courses or other kinds of education. The research project cannot be extended unless approved by the Board of Examiners (see paragraph 2.5).

The supervisor is responsible for providing the requisite materials and equipment and for arranging a suitable workplace, a (shared) computer, and other research project-related issues. The supervisor is responsible for the student's safety in the laboratory. Ultimate responsibility for the research project (contents/planning of the project) rests with the examiner.

2.2   Finding research projects within the Graduate School of Life Sciences

The major research project has to be conducted within the GSLS. In most cases, students are expected to find their own research project, guided by their interests, capabilities and objectives. Which fields of study interest you the most? What are your strengths, or which areas would you like to develop further? What would you like to do after your graduation? These choices are not always clear-cut, and your study counsellor or programme coordinator will be happy to offer personal advice. Use the internet to find more information, and talk to older students and Utrecht researchers.

Your initial source of information is the GSLS study guide. The website of each Master's programme has links to the research groups involved in the programme. Once you have identified your preferred field of study, contact the relevant department(s) for more specific information. Once you have found the research project of your choice, contact your prospective supervisor for details on the size and scope of the research project, who will be your daily supervisor and starting dates. It is important that you request this information, as a research project may not be immediately available or may not be available during certain times of the year. For example, it may not be possible to conduct a fieldwork project in December.

2.3   Finding research projects outside the Graduate School of Life Sciences

You may wish to perform your minor research project at a university in the Netherlands or abroad, or at a company or a non-academic institute. Your programme coordinator and the Board of Examiners have to approve of this. As with a research project within the GSLS, you are expected to find an external research project yourself, for example using the internet. Use your network, maybe you can get into contact with interesting research groups elsewhere via the supervisor of your previous project or another scientific staff member within the GSLS. In this respect, it is particularly useful to have some previous experience and references that you can build on. This is one of the reasons that you are obliged to complete your major research project within the GSLS first.

Bear in mind that you may be subject to terms, conditions and standards adopted by the department that you visit, which might be different than you are used to. For example, a researcher working in the tropics may adopt a more flexible timetable.

In all cases, the student is responsible for arranging his/her own visa, accommodation and insurance. Students can apply for several grants for doing a research project abroad. For information on studying abroad and grant applications, see the website of Utrecht University or the website of the international office of the UMC Utrecht.

2.4   Supervision

Each research project must be (jointly) supervised by at least one examiner, who is a staff member of a research group at Utrecht University or UMC Utrecht. This examiner is responsible for ensuring that the research project is of a sufficiently high academic standard. He or she is also responsible for the final assessment. The daily supervision is in hands of one or more experts in the field, which can be a non-staff member of the research group, i.e. a PhD student or a post-doc (please note, a PhD student / post-doc can**not** act as examiner).

In the case of an external project, it is compulsory that the research project is supervised also by an examiner from the GSLS. The on-site supervisor grades the practical work under approval of the examiner. The examiner:

- Agrees with the proposed research project and with the host institute being of sufficient academic level;
- Acts as distant-supervisor: contacts the student and the supervisor in host institute during the project period to be informed about progress;
- Grades the written report and the final presentation. NB: The on-site supervisor grades the practical work, written report and final presentation. The examiner will consult the on-site supervisor closely on determining the final mark.
- Is the examiner and consequently responsible for the final mark.

In all situations, the examiner from Utrecht University or UMC Utrecht (staff member or head of the research group) is consequently responsible for the research project (contents/planning of the project) and for the final grade.

2.5   Approval of a research project and interim assessment

Like any other part of your Master's programme, the quality and suitability of the projects is assessed by the Board of Examiners before you start the project. You have to complete the application form to ask for approval by the Board of Examiners. Your examiner, external/daily supervisor and your programme coordinator have to sign the application form as well. For each research project and for the profiles (M, C&E or DRS) you have to hand in an application form. In case your project is done outside the UU or UMCU, you should also fill in the internship contract (see paragraph 2.6) together with the application form.

Besides the agreements on the contents of the project, the application form includes several practical matters: when will the project start and finish, when will you and your supervisor go on holiday, when do you take courses, etc. It further contains agreements on the meetings in which you should participate, such as weekly lab meetings, journal clubs, seminars, etc.

The student and the supervisor must conduct evaluation interviews on a regular basis, including an compulsary interim assessment meeting two or three months after the start of the research project. The purpose of the evaluation interview(s) is to allow you and your supervisor to give feedback on your work, progress and performance . What are your strengths, and which points can be improved? Your supervisor can use the Rubrics to indicate for which criteria you are on the right track and which parts can be improved. The Rubrics about presentation and report might not be relevant at this stage. You can also talk about how you experience your research project and the supervision.

Note: You cannot start your project unless you received an email from the Research Project Coordinator, confirming the approval of the Board of Examiners (BoE).! Without proper approval

you may not be covered in case of personal accidents or damage during you project by the insurance of Utrecht University.

The permissions are checked when you are ready to graduate. You must hand in the application form at the Master's Administration Office at least one month (20 working days) before the starting date of your project.

2.6 Additional requirements for research projects outside UU or UMCU

To safeguard mutual clarity and understanding, all students are obliged to fill in the internship contract in case of projects are performed outside the UU or UMCU. In this contract all responsibilities and agreements on the project and supervision, additional to the ones already laid down in the application form, are laid down before the start of the project.

2.7 Secrecy

The host organisation may require the student to apply secrecy during and/or after the research project. However, the examiner (Utrecht supervisor) should be allowed to have access to the reports of the student at all time. In addition, the student should be able to give his/her final presentation at the research group of the examiner. This is laid down in the internship contract and it is important to discuss this with your on-site supervisor. In this case, the student does not have to provide a copy of the report to the Administration Office. Instead of the PDF of the final report, the student can hand in one A4 with the following information: Title of the project; student name, number and Master's programme; name, email addresses and affiliations (e.g. function and company or research group / institute) of the examiner and daily supervisor / supervisor host institute; a short summary of the project and a remark regarding secrecy. Have your examiner either sign the document or confirm via email to the Master's administration that this is indeed a case of secrecy.

2.8 Extension

The elective component (with a maximum of 12 credits) may be used to extend the research project. Extension of a research project or internship with electives is only possible with 6, 9 or 12 credits. This can be indicated on the application form. Only as an exception this can also be done after the project has already started. The Board of Examiners will only grant an extension if this truly results in an extra contribution to the research project and if the extension is requested before the start of the extension. An extension will not be granted if the student needs more time to complete the existing research project, for example due to failed experiments or problems during the analysis or writing phase. In these cases, the research project has overrun and no extra credits will be allocated.

The student can apply for an extension at a later stage by handing in a letter to the Board of Examiners with a formal request, indicating what will be the content of the extension and signed by examiner, programme coordinator and student.

Chapter 3. Research project progress

Each research project has different phases. A research project starts with drawing up a detailed timetable, a literature review and a research proposal, followed by the conduction of experiments and retrieving and analyzing data. However, it is also possible that you start conducting experiments rather early and alternate this with the literate review phase. The final phase of the research project comprises the writing of the report and presenting your work orally.

3.1   Creating a timetable

A carefully drawn up timetable is essential for a successful conclusion of the research project. The student, assisted by the supervisor, draws up the timetable and is responsible for updating it. To avoid your research project overrunning, it is vitally important to refer to it on a regular basis and if necessary make adjustments. Students are often tempted to overrun their planning to just be able to get some extra results. However, this will affect the remaining of your study time and student grant. Remember: you are not being assessed on the amount of results or if you can draw clear, exciting conclusions from them. In contrast, you are assessed on your learning process, skills and competences.
Agreements relating to working hours, evaluation moments, progress meetings etc. can greatly enhance the efficiency and safeguard the smooth progress of your research project.

An example of a timetable and accompanying agreements:

Aims month 1
- Literature study
- Formulate research hypothesis
- Select research methods and techniques
- Make study design
- Train general techniques (cell culture, dissection, specific analyses)

Aims month 2
- Test research method
- Validate research method
- Hand in research plan/project proposal
- (Possibly) oral presentation on research plan
- Discuss research plan/project proposal with supervisor
  - Agreements on supervision
  - Agreements on contact hours
  - Agreements on presence during meetings and discussions

Aims month 3 and 4 (or 3 to 7 in case of a major research project)
  - Perform experiments

Aims month 5 (or 8)
- Perform experiments
- Analyse the results
- Evaluate the results
- Further literature study
- Discuss the results and reflect on your work
- Informal interim report(s) to research group (possibly oral presentation)

Aims month 6 (or 9)
- Write report
  - Agreements about size
  - Agreements about number of copies and copy costs
  - Agreements about the amount of feedback
  - Agreements on secrecy or confidentiality
- Oral presentation
  - Agreements about the audience
  - Agreements about the language (English)
  - Agreements about a test presentation
  - Agreements about assessment

3.2   Drawing up a research plan

Once you start your research project you will have to define the actual research topic of your research project and formulate a research hypothesis. This phase consists mainly of conducting a literature review and discussion with your supervisor. This will enable you to draw up your research plan. In the research plan define your research problem, research topics and/or hypotheses and methodologies. Furthermore give indications on how you envisage planning the different research project components.

Draw up your research plan with care. The majority of students spends too little time on this phase and is keen to start practical research straight away. It is recommended that you commit at least one month to this phase to get a clear idea about where you want to go with the project and to avoid any unforeseen problems. If your research plan is too vague, you have failed to define your objectives correctly. As a result you run the risk of carrying out the wrong experiments, or trying to carry out too many experiments and overrunning. It is therefore vitally important to define your research problem carefully and discuss your plans thoroughly with your supervisor. During this phase, it is conceivable that you already gain experience in general techniques (cell culture, dissection, specific analyses).

You might ask yourself the following questions to help you drawing up a research plan:
- *Why have I selected this particular topic (in this field of study)?*
- *Why does this topic interest me?*
- *What are the aims and objectives of my research project?*
- *How do I demarcate my research area?*
- *Which articles do I need to read if I achieve 5,000 hits on my keyword search?*
- *Can the problem be studied within the available time?*
- *Are my methods, techniques and statistics suitable for this particular research project?*

Your supervisor can assist you in answering these questions and in judging the feasibility of your plans. You may occasionally be asked to present the research plan to the department.
Some students want to make a more extensive project proposal, to get experienced in writing a project proposal (e.g. for grant applications). This is allowed, if you discuss this with your supervisor beforehand. Student and supervisor may also agree to write a project proposal later during the project, when the student is more experienced. It is also possible to write a project proposal in your elective component, after approval of the Board of Examiners.

3.3   Gathering and processing data

Once you have concluded your research plan, you can start the work phase. This may consist of lab or field-based experiments, theoretical, literature-based research or research using computer models. In case of a policy-based, management or educational research project, the work phase could also consist of conducting interviews, developing teaching methods or policy guidelines. Acquiring practical skills means investing time, either with your supervisor or with a technician. During the work phase, your supervisor will give you practical help, monitor your progress, and offer advice and encouragement.
You are expected to indicate if you need help or want to consult your supervisor. Do not hesitate to contact your supervisor if you need help or assistance in a particular area. It is important that you note down exactly what you have done during your experiments. If experiments fail, this will help you to analyse which steps might have gone wrong. You are not always to blame for a failed experiment, often technical problems or the biological material are part of the problem.
During your project it will be essential to keep a lab journal and to save and organise all the gathered data so that it is easy to retrieve. Present the data to your supervisor on a regular basis and use the feedback to adjust your project proposal. Are additional experiments required, do these fit into the timetable?
After performing experiments the data gathered must be analysed. Good organisation of your data is very important, to be able to correctly analyse them and draw conclusions. Statistical analysis is a difficult skill to master, but nevertheless important to value your results.

3.4   Writing phase

The final phase of the research project primarily concerns presentation of your findings both written and orally. A lot of students find this phase particularly problematic. Data need to be clustered into one manageable entity that tells the story of what you found (or did not find). This requires you to select, order, interpret and clearly present your data. Additionally, in order to discuss your results in a coordinated manner, it is quite often essential that you read additional literature.

For the majority of students, this is the first time they have to process large quantities of data. It is easy at this stage to lose sight of your objectives. Start by determining what you want to say.
Ask yourself the following questions:
- *What are my ultimate aims and objectives?*
- *What is the story I want to tell and the message I want to get across?*
- *In what order will I write down the information?*
- *What data will I be using?*
- *How do I order, select and present the data, and integrate it in the report to meet the objectives?*
- *How will I relate my findings to existing ideas?*

The report has to be written in English. You are recommended to draw up a rough outline of your research report and discuss this with your supervisor. This will not only enable you to indicate per paragraph which information and which data to include, but it will also help you to frame the eventual text. Your supervisor will guide and advise you during this phase. Make sure to submit your work in different phases, and get feedback regularly. Draw up agreements beforehand (during the start-up phase) about writing the report and getting feedback. For example, how many draft versions are allowed, what date do I hand them in, and how will they be weighted in the assessment? Once you have clarity on these matters, you will have a clearer picture of where you stand and where you are heading.

In the end, it is all about getting your ideas on paper. Remember: you do not need to be familiar with the exact methods for writing up a project report of this size, it is a learning process. A guideline for writing a scientific paper is available online (see the study guide). Furthermore, carefully read the Rubric about the Research Report, since this (most likely) will be the tool your supervisors use to assess your report. While writing, keep the following in mind: Who is my target audience (general science, scientific journal)? What are the criteria for writing a report? Do I have a rough outline of my contents? How do I formulate academic sentences? How do I use references? How do I edit a text? Is the order in which the information is put logical, is the story clear?

One of the learning goals of the research project is that students learn how to comprehensively report to people from outside the field. Therefore, the student needs to include a summary for laymen, specifically aimed at informing the general audience. This summary for laymen should meet the following requirements:
- Length: The body of the text should be approximately 500 words long.
- Language: The summary should be written in Dutch* or English. (* only if the supervisor is Dutch speaking)
- Level: The text should be understandable for people who finished Biology at a high school level (in Dutch: VWO-level).

The report may be written as a scientific article for submission only if the student will be first author. In that case, consult the author instructions of the scientific journal the article will be submitted to. However, writing a scientific article is a difficult skill to master and your supervisor will interfere with the text and content of an article more than with a research report. Also, in general, the parts of an article (introduction, methods, results, discussion) are as a rule much shorter than those of a project report. It is therefore recommended that you write a research report (and have this assessed) and then, if desirable, continue with the writing of a scientific article.

3.5   Presenting your project

The last phase of your research project involves presenting your work orally to the research group (in English). In case of a research project abroad, you will have to give an oral presentation at both the host institute and the research group of your examiner at Utrecht University or the UMC Utrecht. Carefully read the Rubric about Presentation, since this (most likely) will be the tool your supervisors use to assess your presentation.

To get a clear story, the order in which you show your slides is important.. Make well-organized slides: not too many words or figures per slide, conveniently arranged, no or only few moving objects, readable letter size, figure legends etc. Make use of the slides while telling the story, point out things you want to show. Use images and graphs while telling your story.

While presenting pay attention to the use of your voice: speak clearly and naturally (try not to speak too monotonously), . Taking a glass of water might be useful to take small breaks while talking and give yourself some time to rest and think.

Furthermore, pay attention to your posture. Think about where you want to stand: next to the screen, or in front of it? Behind a desk or not? Try to look at your audience (and not only one

spot), this is more natural and will enhance your audibility. Do not pick at your clothes or fiddle with your notes, this is distracting.

Practise your presentation beforehand with your supervisor, to make sure the order is right and no things are missing or redundant. Make sure to be in the lecture hall on time and test the presentation and movies beforehand. If you prefer, you can print hand-outs as reminder for yourself, but prevent looking at it all the time while presenting.

3.6   Fraud and plagiarism

Utrecht University takes plagiarism very seriously. Those (co-) committing fraud or plagiarism will be punished by the sanctions described in the Education- and Examination Regulations. All reports are scanned by the plagiarism-detection programme Ephorus (see paragraph 4.5).

To avoid plagiarism during writing of a report or essay, it is important to give credit to the sources of information (also if it is a website!). This needs to be done if you copy directly from a text (quotation), but also if you used someone's ideas and put them in your own words (paraphrase). A quotation must always be placed in quotation marks.

A good source citation indicates where the original information can be found. This may include: author(s), title, chapter, page numbers, volume, year and date of publication, internet address. Be rather reserved to refer to websites, since the information on websites may be altered in the course of time.

It is not necessary to cite a source if the information is common knowledge. Information that can be found in numerous places or is likely to be known by a lot of people, is common knowledge (e.g. a cell contains a nucleus).

Chapter 4. Assessment and completion of the project

The assessment of your work is multi-faceted. The assessment criteria are available in the form of Rubrics which cover three specific areas: research skills, the written report and the (final) oral presentation. The acquisition of substantive knowledge (contents), academic skills and your attitude to work are taken into account. Remember that you are not expected to possess all the knowledge, skills and attitudes on beforehand. The purpose is to *learn to acquire* them. Your assessment will be based not only on the end product, but also on the speed with which you manage to acquire knowledge, skills and attitudes, and the final level of knowledge and skills acquired.

4.1   Knowledge

The flexibility offered by the entrance criteria of the Master's programmes results in a variety of entrance skills and competencies possessed by different students. However, even students who select a project that is directly linked with their Bachelor's programme will lack specific knowledge. After all, the research area of each project is highly specialised. During your project you are expected to gain sufficient knowledge by reading literature and attending meetings and discussions, to enable you to understand your project and its relevance in the field of research.

4.2   Skills

During the research project you will have to acquire certain research skills independently for the first time. You have to formulate a problem, independently perform experiments, order and integrate data, and test the data critically against the available literature. In most cases these issues only have briefly been touched on during your Bachelor's programme. The purpose of the research project is that you learn to acquire these skills. You will learn by trying and learning from your mistakes. In this respect, it is important that you take time to reflect on your work on a regular basis. Which aspects are progressing well and which areas need improvement? This way you will be able to grow from a student with very few skills at the start of your research project, to a student able to perform research independently at the end of your project.

4.3   Attitude to work

Your work attitude is an implicit part of the assessment. *Are you actively participating in meetings, do you take initiative and do you work independently?* Students are expected to gradually develop a good work attitude during their research project. A pleasant working relationship with other staff members is also a factor. *Are you able to cooperate? Are you able to receive and give feedback? Do you ask for help when needed and are you able and willing to help others?*
Furthermore it is important how you deal with the project and your own progress. *Do you persist when faced with setbacks and failure? And are you flexible enough to change things if necessary? How do you handle feedback?* These aspects determine whether you are a suitable research candidate and will therefore partly determine your final mark.

4.4   Research projects learning outcomes

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

In order to assess whether the student has achieved these learning outcomes, the following list of items for research projects can be used.

4.5   Interim assessment

For each research project and internship an interim assessment meeting is *mandatory*. This consists of an evaluation session between the student and the examiner (and the daily supervisor), discussing the student's progress based on the assessment criteria for the project/internship. The Rubric on Research skills can be used as a tool for interim assessment. Since the interim assessment is a mandatory part of your project, you have to hand in a report of this meeting. There are two options:

- If your supervisor used the rubrics to give you feedback, hand in a pdf of the highlighted rubric signed by your supervisor.
- If no rubrics were used, write a short report (½ A4) using either the Interim assessment form - inside (project at the UU/UMCU) or the Interim assessment form - outside (projects outside the UU/UMCU).

Hand in the rubric or report as soon as possible at the administration office. Without a registered interim assessment you cannot complete the project/internship. To safeguard the process the GSLS will notify the examiners beforehand and will also monitor the registration of the interim assessments.

4.6   Final assessment

The assessment is performed by the examiner from Utrecht University or the UMCU, in close consultation with a second, independent reviewer and, if applicable, the daily supervisor. The second reviewer is a staff member who is not involved with the student's project directly, and is required to assess the report and presentation. If your daily supervisor was a PhD-student or a post-doc (a non-staff member), (s)he can**not** act as second reviewer (but will be consulted by the examiner).

In case of an external research project, the daily supervisor will be the on-site supervisor (staff member) at the host institute and the examiner will be a staff member of Utrecht University or UMC Utrecht. The on-site supervisor grades the practical work, the written report and the final presentation. The Utrecht supervisor grades the written report and the final presentation and he/she is responsible for the final mark.

The weighting of the practical work, written report and verbal presentation is 60%, 30% and 10% of the final grade respectively. Some supervisors systematically identify and weight assessment criteria for the different components, which they consider particularly important to arrive at a final mark. Others may weigh up these factors more instinctively. The assessment criteria for the research project mentioned above are formulated by the Board of Examiners and should be used by your supervisor for your assessment.

4.7   Ephorus

Ephorus is a plagiarism detection software system, used by Utrecht University. Ephorus compares your report with other texts, for example with international journal articles but also with other uploaded reports and theses from all Ephorus using educational institutes around the world. The programme sends a report with its findings to your examiner. It is up to him/her to check the results of Ephorus and notify you in case of detected plagiarism. It is the responsibility of the examiner to notify the Board of Examiners in case he/she suspects you meet the plagiarism definition, as described in art. 5.14 of the EER 2014-2015. The Board of examiners will determine if plagiarism occurred and will decide on the sanctions in accordance with art 5.14 EER. Refer to paragraph 3.6 for tips on how to avoid plagiarism.

How to use Ephorus
If your research project report needs to be checked for plagiarism, there are two possible ways:

1. You upload the document yourself
Only upload the final version or your report, as it will be stored in the database immediately. Uploading a second version of your text will give a high percentage of overlap. Your supervisor has to have an Ephorus account, more information is available on the study guide.
There are two possible ways of performing a plagiarism check:

1. You upload the document yourself
You can upload the final version in Ephorus via this link: http://student.ephorus.nl. Ephorus will ask you for an 'inlever code', which is your supervisors e-mail address related to his/her account. After you have uploaded your files your supervisor will receive an e-mail with the results, depending on his/her settings. Ephorus gives the result in the form of a percentage. If this

percentage is >10%, your examiner needs to explain this in writing. You should hand in this written motivation at the Master's administration office, together with the assessment form and the plagiarism check summary.

2. Your supervisor uploads the document
The final version of your report can also be uploaded in Ephorus by your examiner. (S)he can log in via this link and following the instructions below:
- Click on the button 'Upload'.
- Select the file you wish to check and select the folder in which you would like to store the results of the plagiarism check.
- Click on the uploaded file to see the percentage of plagiarism.
- If this percentage is >10%, the examiner need to explain this in writing. This written motivation should be handed in (together with the assessment form and a the summary of the plagiarism check) by the student at the Master's administration office.

You can only submit the assessment form of your research project if the result from Ephorus is attached to the assessment form.

4.8   Completion of the research project

After completing your research project, please complete the following steps:
- Give a hard copy of your report to your examiner, second reviewer, and programme coordinator.
- Check with your supervisor if there are any restrictions on publication (embargo). If this is the case, your supervisor should upload the writing assignment him- or herself in Ephorus. This can be done under embargo.
- Email your research project report in pdf format to the master's administration office.
  If your assignment has to remain confidential, follow these guidelines.
- Get an assessment form from the Administration Office or STIP. Your examiner and second reviewer have to complete an sign the assessment form within 10 working days after you handed in the final version of your writing assignment. Subsequently, let your programme coordinator sign the assessment form.
- A motivation for your grade (for all grades, not just if your final grade is ≤ 6 or ≥ 8.5) from your examiner should be added to your assessment form. Your examiner can use the rubric to motivate the grade. (S)he can either add a signed, printed motivation to the assessment form or send this motivation to the Administration Office via email.
- Complete the writing assignment evaluation form (attached to the assessment form).
- Hand in the assessment form, the evaluation form and the Ephorus result and motivation grade at the Administration Office.

Chapter 5. Problems during the research project

There may be times when you disagree with your supervisor about your research project, or when you are not sure what is expected of you. In other cases you may be experiencing personal problems, causing the research project to overrun or make you decide to stop with your project. It is important to identify and recognize problems in time and look for solutions as quickly as possible to prevent escalation, further problems and overrunning of your project and study.

5.1   Pointing out problems

It is vitally important to conduct regular evaluation meetings with your supervisor to identify and discuss any bottlenecks. An obligatory evaluation meeting should take place two or three months after the start of the research project. Please note that these evaluation meetings can be seen as interim assessment conversations, which are different from regular work discussions. Make sure you well-prepare these meetings: know what you think and want, and how to describe this. Keep the following questions in mind: *Are you under excessive time pressure? Is the topic still sufficiently interesting? Are you receiving sufficient and appropriate feedback? Do you still have a clear idea of why you are conducting these experiments? Is the lab/field teamwork progressing successfully? Are you on target with regard to writing your report? Are you getting on well with your supervisor?*

A substantial difference of opinion can arise if the supervisor believes that your work is of an insufficiently high quality or quantity. You may feel that you are receiving insufficient supervision. A personal dispute may arise if you and/or your supervisor think that the other party has failed to meet personal expectations such as a positive and pro-active attitude to work, taking responsibility for specific issues and honouring agreements. This can cause seemingly unsolvable frustrations.

5.2   Resolving disputes

It is important to make agreements on beforehand to throw some light on your own and your supervisors expectations and responsibilities and to prevent problems. If in spite of such a agreements disputes arise, the student and supervisor(s) are required to consult each other first, for example during an (evaluation) meeting. If this fails to resolve the dispute, please do not hesitate to contact the programme coordinator or study counsellor. The consultation with the study counsellor is confidential. With the prior approval of the student and supervisor, the study counsellor contacts the other party or other experts (for example the programme coordinator or institute director) for further mediation.
If the dispute has failed to be resolved after consulting the programme coordinator or study counsellor, the student (but not the supervisor) can submit an appeal with the Board of Examiners. The Board of Examiners will assess whether any mistakes were made in handling the dispute.
Lastly, the student is entitled to submit a complaint with the university 'Examinations Appeals Board'. This board is solely charged with assessing procedural mistakes. In case of any dispute on personal grounds, the student can contact the study counsellors and if necessary via them the Complaints coordinator, which is prof. Lodewijk Tielens for Biomedical Sciences or dr. Cocky de Wolf for the faculty of Science.
If any personal problems result in a delay of your study programme, please contact the academic counsellor as soon as possible for advice.

5.3   Premature termination of the research project

The student is entitled to terminate the research project prematurely. This could be due to a variety of reasons: the research project has failed to meet expectations, or the student is experiencing personal problems that interfere with continuation of the research project. Before deciding to terminate your project prematurely you are advised to contact the study counsellor first and discuss the matter with him/her. The study counsellor will also advise you on further progress of your study. You must notify your supervisor and programme coordinator as soon as possible on your decision to terminate the research project. Note: No credits will be allocated to prematurely terminated research projects.

A research project may also be terminated by the supervisor. This may be the consequence if the student's fails to honour the agreements, commits fraud or plagiarism or fails to remain in contact with the supervisor, without giving substantiated reasons. The following guidelines can be used:

1. The student has failed to honour the agreements laid down in the application form (and the internship contract if applicable) and has been reprimanded clearly on several occasions by the supervisor.
2. The student has been granted at least two opportunities to redeem him/herself by continuing the research project in the agreed manner. The student must have been notified in writing.
3. The supervisor has stipulated a clear deadline in the second letter, warning the student that the research project will be terminated in the event of continued non-compliance. The student will be notified in writing if the research project is deemed to have been terminated.
4. The supervisor has sent copies of this correspondence to the programme coordinator and study counsellor.
5. The student is entitled to submit an appeal against this decision with the Board of Examiners.

Chapter 6. More information & contact

A large part of the information you need is available on the study guide of the Graduate School of Life Sciences, such as contact information of administration officers, international officers or the board of examiners.

Further reading
Below is a selection of books dedicated to conducting research, on effective interview techniques, and on avoiding and solving bottlenecks during the writing phase (all in Dutch):
- Heinze Oost en Angela Markenhof, Een onderzoek voorbereiden. HB Uitgevers 2005, ISBN 9055743763
- Heinze Oost, Een onderzoek uitvoeren. HB Uitgevers 2002, ISBN 9055743739
- Heinze Oost en Janny de Jong, Een onderzoek rapporteren. HB Uitgevers 2005, ISBN 9055743747
- A. Markenhof, M. Bastings, et al., Een onderzoek presenteren. HB Uitgevers 2002, ISBN 9055743755
- M. van de Berg, Effectieve tweegesprekken. Sdu Uitgevers 2006, ISBN 9052615683 Schoonhoven, Academic Services.
- M. J. A. Mirande en E. Wardenaar, Scriptieproblemen. Noordhoff Uitgevers b.v. 1997, ISBN 9001589332

Further training
The COLUU institute (Centre for Teaching and Learning) offers several courses a year for students on different subjects, eg. study skills. Have a look at their Dutch website to see which trainings are offered.