

Master of Applied Science in Molecular Life Sciences (MMLS)

Graduate Profile Description

1. Professional profile

1.1. Summary

After graduation, the Master of Molecular Life Sciences (MMLS) is able to plan and carry out a project^(*) in the *product development phase* in different fields of biotechnology.

Just after graduation, these projects have a length of 3-4 months. It is expected that the length of the projects will increase when the MMLS is getting more experienced.

1.2. Work field

The MMLS graduate has a profound knowledge of molecular and cell biology of prokaryotic and several eukaryotic organisms, thereby being specialized to perform projects in different areas of biotechnology.

Moreover, by being trained to think and communicate interdisciplinary and in an entrepreneurial way (project management, patent searches, cost analyses, SWOT analyses), the MMLS typically has a role in the *development phase* in industry, or in *translational research* in research institutions.

The Master of Molecular Life Sciences can work at:

- A. Companies active in biotechnology, such as pharmaceutical companies, companies in personal health care, diagnostic companies, food- and feed industry, etc. These can be small and medium enterprises as well as multinationals.
- B. Research institutions such as universities, hospitals or governmental/private (contract) research institutes.

Examples are:

- A. Schering-Plough (Merck), DSM, Dyadic, AM-Pharma, Synthon BV, Meddens diagnostics, Qiagen, European Veterinary Laboratory, DMV international, Falco Diagnostics (previously Lactrys Diagnostics BV)
- B. TNO, NCMLS, Radboud University and Hospital Nijmegen

^(*) When “project” is mentioned in this document it can also mean part of project.

Position of MMLS:

The name of the position the MMLS has within companies varies. Examples are *Senior Technician, Application Specialist* or *Junior Project Leader*.

The MMLS can also start with a PhD project *in translational research* at a research institution.

2. Differences between MMLS (a Master of Applied Science) and the Bachelor of Applied Science and the Master of Science

2.1. Professional tasks

The Bachelor of Applied Science (in the Netherlands: HBO Bachelor) in the area of Biological and Medical Laboratory Techniques has a supportive role in performing fundamental or applied research. The Bachelor of Applied Sciences is able to independently carry out experiments under the weekly supervision of more theoretically trained staff.

In contrast to the Bachelor, both Masters of Science and Masters of Applied Sciences are able to design projects, to carry them out independently, to draw conclusions, and to advice about other projects.

The difference between the Master of Science and the Master of Applied Science is based on the type of projects they are involved in. While the Master of Science is mainly involved in *fundamental research* at universities and in the *idea/feasibility research phase* in industry, the Master of Applied Sciences is typically involved in the *development phase* in industry or in the *translational research* at universities.

These two different project types require different ways of approaching a project as summarized in figure 1.

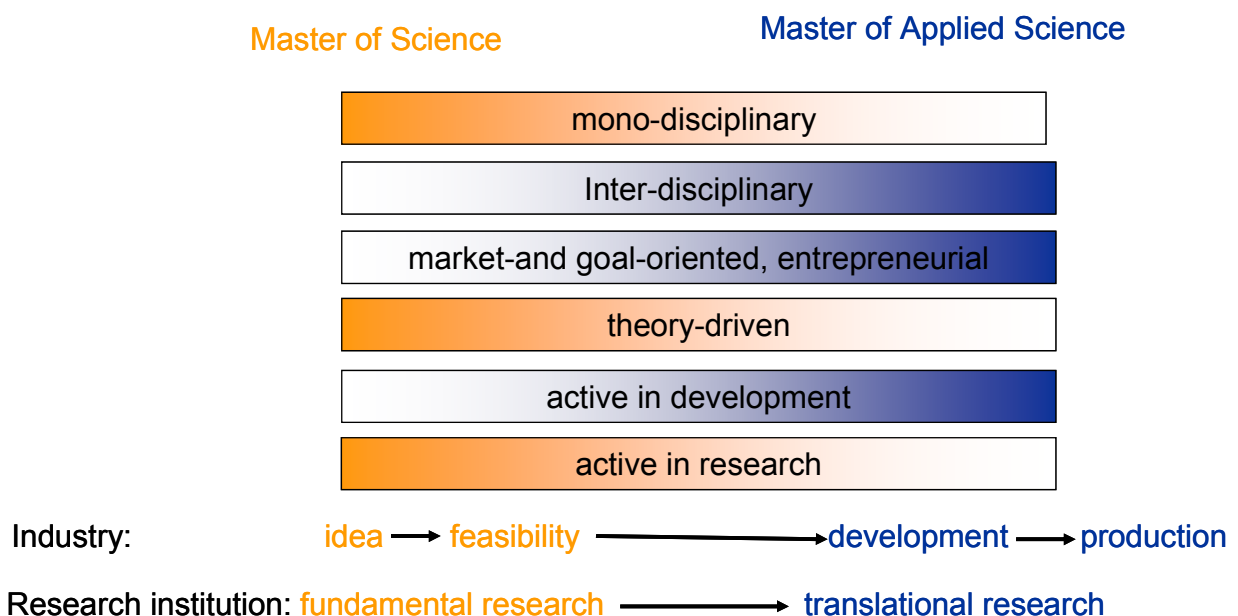


Figure 1. Schematic depiction of the types of projects the Master of Science and the Master of Applied Science are involved in and the consequence on their professional profiles.

2.2. Competences

To perform the specific professional tasks as described above, the Bachelor of Applied Science, the Master of Science and the Master of Applied Science need specific competences (visualized in figure 2A,B).

The most important competences of the Bachelor of Applied Science are those required to carry out experiments.

The outstanding competences of the Master of Science are those that enable him/her to design new research based on the theory and new ideas.

The characteristic competences of the Master of Applied Sciences are those that enable him/her to design product development strategies and to manage projects in terms of product, time and costs.

In addition to the characteristic competence for each of the graduates, they need additional competences. In parts, these competences are shared between the three groups; though the focus of the respective competence varies between them (see figure 2C).

Both Masters of Science and of Applied Science are able to carry out experiments on at least the same level as the Bachelor of Applied Science (provided their pre-education was to a Bachelor of Applied Science; not the Bachelor of Science).

Being qualified to communicate is another competence in general shared by all three groups. However, the focus of this competence differs between them. Bachelors communicate predominantly orally about their experiments within the research group. On top of this, Masters of Science need to be able to write and talk to experts in the field according to internationally accepted standards in English. In the communication of Masters of Applied Science, the interdisciplinary aspect is highlighted. This Master has to communicate with people of different backgrounds within and outside the department. Communication is an integrated part of many other activities such as managing projects and advising (Figure 2A). Overall, Masters are expected spend more of their time communicating (about 20%) than Bachelors (about 10%).

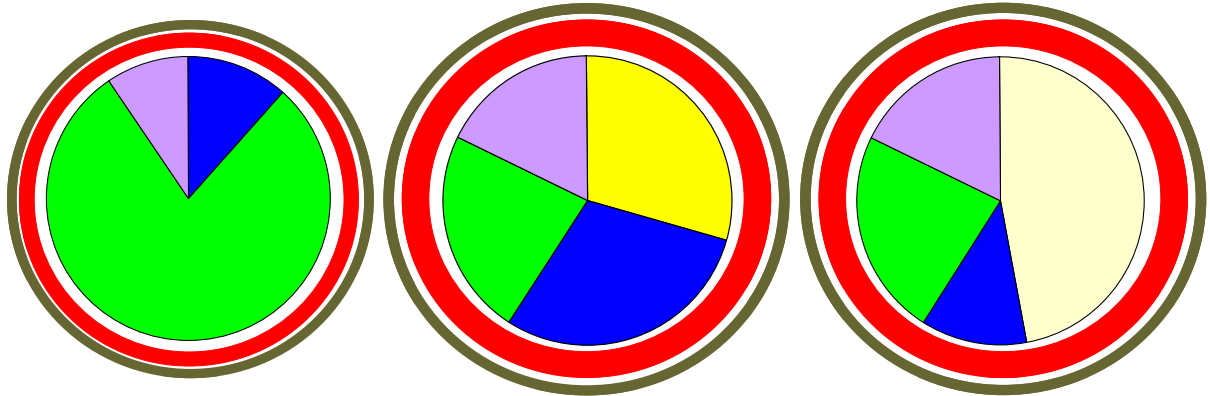
As mentioned above, the Master of Science designs research projects based on the theory and new ideas. The Master of Applied Science needs to be competent in project design as well, however, he/she designs a product development strategy in a product-, goal- en market-oriented way. This implies that he/she has to be aware of the basic research done already, but also of other facts that influence product success, such as costs, competitors or the patent situation. The Bachelor graduate has usually no role in project design.

A.

Bachelor of Applied Science

Master of Applied Science

Master of Science



- Carrying out experiments
- Designing research strategies
- Designing development strategies
- Managing projects
- Advising
- Communicating
- Being professional

Figure 2 A. Schematic depiction of the working activities and therefore the needed competences of the Bachelor of Applied Science, Master of Applied Science and Master of Science relative to their total working activities.

The scheme indicates that carrying out experiments, designing research or development strategies, managing projects and advising are practised to different extends by the different graduates (relative to their total working package), while communicating and being professional need to be applied during all other activities as well.

B.

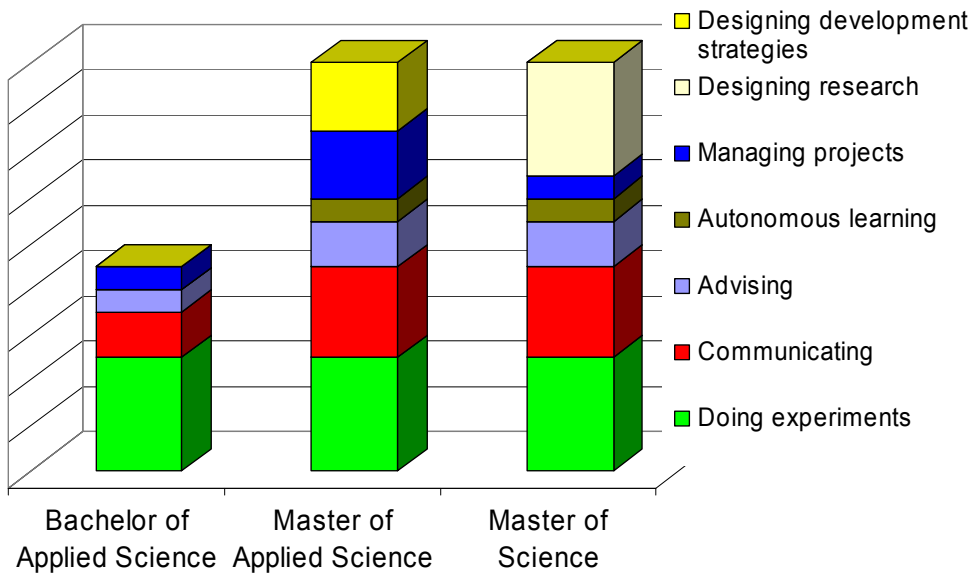


Figure 2 B. This graph indicates the development of additional competences when Bachelors of Applied Sciences are educated to either the Master of Applied Science or the Master of Science.

The Master of Applied Science is predominantly educated to become competent in Designing development strategies, Managing projects, and communicating and advsing in an interdisciplinary way, while the Master of Science is predominantly educated to become competent in Designing research strategies and communicating and advising about research to experts in the field.

C.

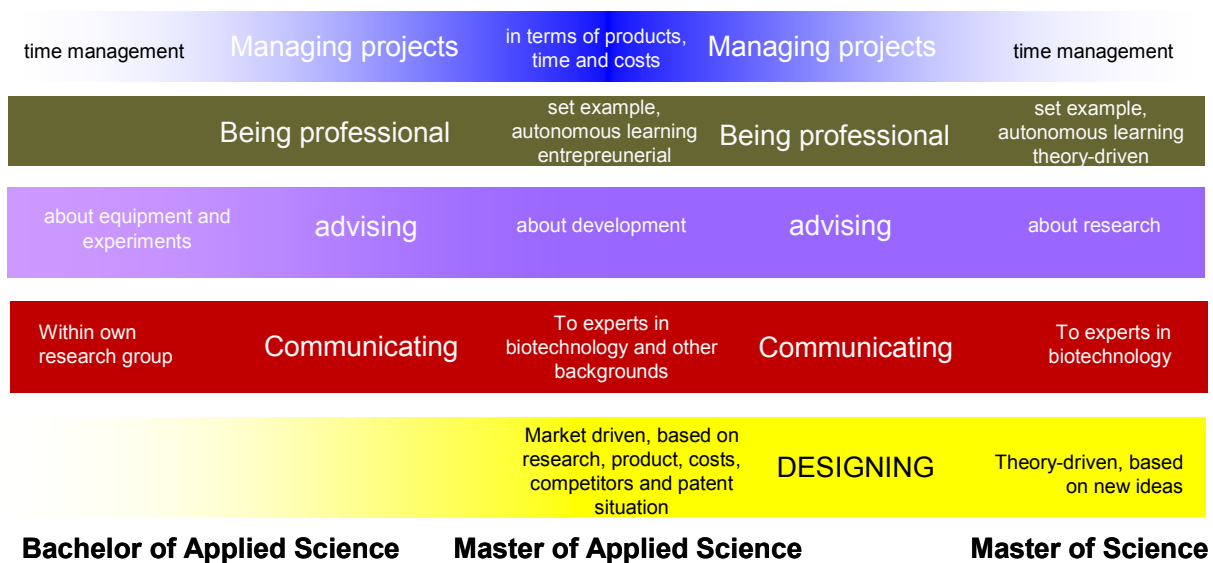


Figure 2 C. Different focusses or additional criteria of the competences Designing, Communicating, Advising and Being professional needed by the Bachelor of Applied Science, the Master of Applied Science and the Master of Science.

In line with this, the Master of Science is able to give argument-based advice about research projects to others, while the Master of Applied Science mainly advises about project feasibility to people within and outside the own department. The Bachelor of Applied Science, in contrast, is able to advice about lab equipment or experimental techniques within the research group.

The ability to manage projects in terms of product, time and money is typical for the Master of Applied Science. It is a minor competence of the Bachelor of Applied Science and the Master of Science (when educated from the Bachelor of Applied Science) and interpreted only in terms of time management for these two groups.

Graduates of all three groups need to be professional in the terms of being pro-active, team-oriented personalities who reflect on their own actions, deal with feedback and are open to learn. Both Master graduates are expected to set an example for others and to learn autonomously. While the Master of Sciences is mostly a theory-driven curious personality, the Master of Applied Science clearly shows entrepreneurial characteristics.

2.3. Master of Molecular Life Sciences – final qualifications

The description of the professional tasks and the general competences needed by the Master of Applied Science, in this case: Master of Molecular Life Science, results in the detailed description of the criteria for the MMLS graduate presented in Table 1.

Table 1: Final qualifications of the MMLS per competence/ detailed criteria describing the MMLS competences

Competences	Indicator/ Final qualification
Designing development strategy	1. Preparation/problem analysis a. Defines the correct project aim based on knowledge or/and by consulting colleagues/internal documents/literature. b. Becomes expert of the new subject by consulting the specific literature and other resources. Is able to identify reliable and suitable sources. Discriminates between major and side issues. Combines information from different sources.
	2. Designs different approaches that could lead to project aim. Evaluates these possibilities and chooses the best approach.
	3. Develops a complete research project leading to the project aim (project of about 3-4 months; see also: managing projects).
	4. Recognizes and describes opportunities to patent products/results as well as patent blocks.
	5. Analyses chances, risks and competitors, resulting in a SWOT analyses.
Carrying out Experiments	1. Carries out experiments according to good manufacturing practice
	2. Solves practical problems if experiments do not work as planned (trouble shooting). Couples back to the theory or consults colleagues if necessary. Suggests alternative experiments.
	3. Applies strict logical thinking to draw conclusions from the results and interprets them: - in the view of the experiments - in the view of the project aim (helicopter view) in comparison to other analyses, reference values or theoretical values in the literature.
Communication	15a. Reports project plans and in a research article in English according the format used in the company/field. After minor revision by the project leader, this project report is on the level to be used internally/published in international journals. 15b. Writes patent applications.
	16. Orally presents research to colleagues, other researchers in the field, client. The presentation has a clear structure, convincingly and correctly represents the research performed and is interesting to follow. It is on the level to be presented at international symposia.
	17. Reports about the project to people who have different backgrounds than biotechnology (for instance: client, marketing department).
	18. Is able to set up and moderate efficient meetings.
Managing projects	1. Estimates the needed budget to realize the project taking 3-4 months (including costs of personnel and material)
	2. Translates the designed research project into a project proposal that includes: - deliverables (in quality and quantity) - experimental approach - time schedule - risk analysis and success chances - responsibilities and communication plan - budget planning - exclusions This proposal is written en verified under the responsibility of the project leader.
	3. Evaluates whether the project aim can be achieved with the resources available (personnel, time, equipment, money).

	<p>4. Manages own research project by:</p> <ol style="list-style-type: none"> a. Planning, organizing and analysing own activities and guarding progress. b. Finishing all activities correctly, even under time pressure. c. Setting priorities and working efficiently in light of defined research aim d. Flexibly deals with changing circumstances e. Properly using communication skills: reporting, presenting, consulting and advising <p>5. Efficiently works together in a team (colleagues, project leader, client) in all phases of the project.</p> <p>6. Keeps client informed about project progress during all stages, especially when the project is not progressing as planned.</p>
Advising	<ol style="list-style-type: none"> 1. Transfers/relates own project results to similar projects of others and defend own ideas with arguments. 2. Actively participates in a discussion about the own or related projects with the project leader/colleagues and advises about follow-up projects and projects of colleagues. 3. Integrates own project results in the multidisciplinary defined goals and to advise other departments 4. Gives advice about choosing new machines or methods based on information found on own initiative and independently.
Acting professional and guiding professional development	<ol style="list-style-type: none"> 1. Shows a pro-active, curious, scientific and entrepreneurial attitude: adapts quickly; acts honestly, efficiently and goal-oriented, motivates him/herself and shows initiative. 2. Defines personal learning goals (based on project/work requirements) and guides personal development to reach learning goals. 3. Sets an example for others.