

Assessment report  
Limited Framework Programme Assessment  
**Bachelor Farmaceutische Wetenschappen**  
VU Amsterdam

*Contents of the report*

1. Executive summary .....	2
2. Assessment process .....	4
3. Programme administrative information.....	6
4. Findings, considerations and assessments per standard .....	7
4.1 Standard 1: Intended learning outcomes .....	7
4.2 Standard 2: Teaching-learning environment .....	10
4.3 Standard 3: Student assessment.....	12
4.4 Standard 4: Achieved learning outcomes .....	14
5. Overview of assessments.....	15
6. Recommendations .....	16

## 1. Executive summary

In this executive summary, the panel presents the main considerations which led to the assessment of the quality of the Bachelor Farmaceutische Wetenschappen programme of VU Amsterdam, which has been assessed according to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, as published on 20 December 2016 (Staatscourant nr. 69458).

The panel considers the programme objectives to be very sound. The panel regards the programme profile to be very strong, the programme occupying a unique place among the programmes in this domain in the Netherlands and abroad. The panel proposes for the programme to remain within this niche and not to broaden the scope. The panel also suggests to consider renaming the programme to better reflect this profile. The panel advises to communicate the profile and the features of this programme more clearly.

The panel characterises the programme as being geared toward the study of the chemical dimensions of drug discovery, especially in the first phases of the drug discovery and development processes. The panel finds the programme to be scientifically sound and up to date.

The objectives of the programme are within the boundaries of the domain-specific reference framework for academic chemical sciences programmes. The panel appreciates the efforts by the joint programmes in chemical sciences in the Netherlands to draft this framework and regards this to be a sound and up-to-date description of this domain. The programme profile may be clearly distinguished within the framework.

The panel welcomes the comparison to other programmes in the Netherlands, demonstrating the profile and the specific features of the programme.

The panel is positive about students being educated to enrol in various master programmes in this domain.

The panel suggests to intensify the interaction with the professional field advisory committee.

The intended learning outcomes of the programme correspond to the programme objectives, are well-articulated and are conform to the bachelor level.

The student inflow numbers of the programme are appropriate. The panel regards the entry requirements to be clear and relevant and the admission procedures to be adequate. The profile and contents of the programme are clearly communicated to prospective students. The panel welcomes students not having taken mathematics B in their secondary education to be offered a course to remedy their deficiencies in this respect.

The curriculum meets the intended learning outcomes of the programme. The courses and projects are up to standard, with a pronounced and strong focus on chemistry subjects. The number of practical classes is adequate. The panel is positive about the breadth and the coherence of the curriculum.

The panel regards the lecturers in the programme to be skilled and motivated and their educational capabilities to be up to standard. As the workload is demanding for lecturers, the panel advises to balance the workload by providing more support from the Faculty departments and VU central departments.

The educational concept and the study methods conform to programme characteristics. Educational innovation in the programme is pursued strongly, lecturers having adopted blended learning, web-lectures and flipped classrooms. The number of hours of face-to-face education and the class sizes are appropriate. The number of drop-outs in the first year is substantial, but the programme may be regarded to be quite demanding and the student-success rates are appropriate.

The panel approves of the programme examinations and assessment rules and regulations, but advises to harmonise the rules and regulations of the two Examination Boards of the Faculty.

The examination methods adopted in the programme conform to the goals and contents of the courses.

The supervision processes for the Bachelor projects have been well-organised. The assessment procedures are up to standard, involving two examiners assessing the work separately and on the basis of rubrics scoring forms. Although the oral feedback by examiners on the Bachelor project results may be adequate, the panel suggests to provide more extensive written feedback.

The panel considers the measures ensuring the validity, reliability and transparency of examinations and assessments to be adequate.

The course examinations are quite challenging. The Bachelor theses match the intended learning outcomes and are appropriate research projects. The theses' level and quality differ, which is reflected in the grades. The panel supports the grades given by the programme examiners.

The panel regards the programme graduates to have reached the intended learning outcomes and to be qualified to enrol in master programmes in this domain.

The panel that conducted the assessment of the Bachelor Farmaceutische Wetenschappen programme of VU Amsterdam assesses this programme to meet the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, judging the programme to be satisfactory. Therefore, the panel advises NVAO to accredit the programme.

Rotterdam, 25 February 2019

Prof. dr. M.A. Cohen Stuart  
(panel chair)

drs. W. Vercouteren  
(panel secretary)

## 2. Assessment process

The evaluation agency Certiked VBI received the request by VU Amsterdam to manage the limited framework programme assessment process for the Bachelor Farmaceutische Wetenschappen programme of this University. The objective of the programme assessment process was to assess whether the programme would conform to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, published on 20 December 2016 (Staatscourant nr. 69458).

Having conferred with management of the VU Amsterdam programme, Certiked invited candidate panel members to sit on the assessment panel. The panel members agreed to do so. The panel composition was as follows:

- Prof. dr. M.A. Cohen Stuart, professor emeritus, chair of Physical Chemistry & Colloid Chemistry, Wageningen University, professor emeritus of Physical Surface Chemistry, University of Twente, professor East China University of Science and Technology, Shanghai, China (panel chair);
- Prof. dr. A.H.T. Boyen, associate professor emeritus, Faculty of Sciences and Bio-engineering Sciences, Faculty of Medicine and Pharmacy, Vrije Universiteit Brussel (panel member);
- Prof. dr. R.M.J. Liskamp, professor, chair Chemical Biology and Medicinal Chemistry, School of Chemistry, University of Glasgow, United Kingdom, professor of Molecular Medicinal Chemistry, Utrecht University (panel member);
- Prof. dr. K. Augustyns, professor of Medicinal Chemistry, Dean Faculty of Pharmaceutical, Biomedical and Veterinary Sciences, University of Antwerp (panel member)
- Dr. M. Monshouwer, senior director and EU head Pharmacokinetics, Dynamics and Metabolism, Johnson & Johnson, Janssen Pharmaceuticals (panel member);
- A.E.M. Melcherts BSc, student Master in Nanomaterials Science, Utrecht University (student member).

On behalf of Certiked, drs. W. Vercooteren served as the process coordinator and secretary in the assessment process.

All panel members and the secretary confirmed in writing being impartial with regard to the programme to be assessed and observing the rules of confidentiality. Having obtained the authorisation by the University, Certiked requested the approval of NVAO of the proposed panel to conduct the assessment. NVAO have given their approval.

To prepare the assessment process, the process coordinator convened with management of the programme to discuss the outline of the self-assessment report, the subjects to be addressed in this report and the site visit schedule. In addition, the planning of the activities in preparation of the site visit were discussed. In the course of the process preparing for the site visit, programme management and the Certiked process coordinator regularly had contact to fine-tune the process. The activities prior to the site visit have been performed as planned. Programme management approved of the site visit schedule.

Well in advance of the site visit date, programme management sent the list of final projects of graduates of the programme of the most recent years. Acting on behalf of the assessment panel, the process coordinator selected the theses of 15 graduates from the last few years. The grade distribution in the selection was ensured to conform to the grade distribution in the list, sent by programme management.

The panel chair and the panel members were sent the self-assessment report of the programme, including appendices. In the self-assessment report, the student chapter was included. In addition, the expert panel members were forwarded a number of theses of the programme graduates, these theses being part of the selection made by the process coordinator.

Several weeks before the site visit date, the assessment panel chair and the process coordinator met to discuss the self-assessment report provided by programme management, the procedures regarding the assessment process and the site visit schedule. In this meeting, the profile of panel chairs of NVAO was discussed as well. The panel chair was informed about the competencies, listed in the profile. Documents pertaining to a number of these competencies were presented to the panel chair. The meeting between the panel chair and the process coordinator served as the briefing for panel chairs, as meant in the NVAO profile of panel chairs. Prior to the date of the site visit, all panel members sent in their preliminary findings, based on the self-assessment report and the final projects studied, and a number of questions to be put to the programme representatives on the day of the site visit. The panel secretary summarised this information, compiling a list of questions, which served as a starting point for the discussions with the programme representatives during the site visit. Shortly before the site visit date, the complete panel met to go over the preliminary findings concerning the quality of the programme. During this meeting, the preliminary findings of the panel members, including those about the theses were discussed. The procedures to be adopted during the site visit, including the questions to be put to the programme representatives on the basis of the list compiled, were discussed as well.

On 29 and 30 October 2018, the panel conducted the site visit on the VU Amsterdam campus. The site visit schedule was as planned. In a number of separate sessions, the panel was given the opportunity to meet with Faculty Board representatives, programme management, Examination Board members, lecturers and final projects examiners, and students and alumni.

In a closed session at the end of the site visit, the panel considered every one of the findings, weighed the considerations and arrived at conclusions with regard to the quality of the programme. At the end of the site visit, the panel chair presented a broad outline of the considerations and conclusions to programme representatives. Clearly separated from the process of the programme assessment, assessment panel members and programme representatives met to conduct the development dialogue, with the objective to discuss future developments of the programme.

The assessment draft report was finalised by the secretary, having taken into account the findings and considerations of the panel. The draft report was sent to the panel members, who studied it and made a number of changes. Thereupon, the secretary edited the final report. This report was presented to programme management to be corrected for factual inaccuracies. Programme management were given two weeks to respond. Having been corrected for these factual inaccuracies, the Certiked bureau sent the report to the Board of VU Amsterdam, to accompany their request for re-accreditation of this programme.

### 3. Programme administrative information

Name programme in CROHO: B Farmaceutische Wetenschappen (B Pharmaceutical Sciences)  
Orientation, level programme: Academic Bachelor  
Grade: BSc  
Number of credits: 180 EC  
Specialisations: n.a.  
Location: Amsterdam  
Mode of study: Full-time (language of instruction Dutch)  
Registration in CROHO: 56989

Name of institution: VU Amsterdam  
Status of institution: Government-funded University  
Institution's quality assurance: Approved

## 4. Findings, considerations and assessments per standard

### 4.1 Standard 1: Intended learning outcomes

The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

#### *Findings*

The Bachelor Farmaceutische Wetenschappen programme is offered by the Department of Chemistry & Pharmaceutical Sciences of the Faculty of Science of VU Amsterdam. The dean of the Faculty has the responsibility for all programmes of the Faculty. This Bachelor programme is part of the Bachelor College of Natural Sciences and Mathematics of this Faculty. The director of the programme is responsible for the delivery and quality of the programme. The programme director is assisted by the programme coordinator and study advisor. The Programme Committee for both the Bachelor Farmaceutische Wetenschappen and the Master Drug Discovery and Safety programmes, being composed of three lecturers and three students, advises programme management on quality issues. The sub-committee of the Faculty Examination Board for the Bachelor Farmaceutische Wetenschappen and Master Drug Discovery and Safety programmes has the responsibility to ensure the quality of examinations and assessments of the programme.

The Bachelor Farmaceutische Wetenschappen is a three-year, research-based, multi-disciplinary academic bachelor programme in the field of medicinal chemistry and drug discovery, geared toward the first stages of the drug discovery and development process. The programme is rooted in research done at the Department of Chemistry & Pharmaceutical Sciences of VU Amsterdam. The objectives of the programme are to educate students thoroughly in the molecular sciences for health and medicinal purposes. Students are offered knowledge of medicinal chemistry and drug action, are trained in a broad range of subjects in this domain as well as in general academic skills and academic attitudes.

The objectives of the programme are conform to the domain-specific reference framework for the chemical sciences in the Netherlands, which has been drafted by the joint programmes of this assessment cluster in the Netherlands. In this domain-specific framework, reference has been made to international frameworks and benchmark statements. This VU Amsterdam programme may be regarded to be positioned in the pharmaceutical sciences sub-domain of chemical sciences.

Programme management compared this programme to other programmes in the Netherlands in the pharmaceutical sciences sub-domain. From this comparison, this programme emanates as being very strongly chemistry-based and as having quite a unique position in the chemical sciences domain.

The programme aims at preparing students for a broad range of master programmes. These programmes are, among others, Master Drug Discovery and Safety of VU Amsterdam and Master Chemistry of VU Amsterdam and University of Amsterdam. The Master Pharmacy of Utrecht University admits students, after having taken the pre-master programme. The students are not primarily educated to enter the labour market. Students may, however, take the educational minor (30 EC), allowing them to become second degree qualified teachers in Chemistry in Dutch secondary education.

The professional field advisory committee meets with programme management to discuss the alignment of the programme with professional field requirements, especially in the case of curriculum adaptations.

The programme objectives have been translated into intended learning outcomes, specifying theoretical and practical knowledge of chemistry and of pharmaceutical sciences, physics, mathematics, informatics, biology and medical physiology, knowledge of safety and environmental aspects in this field, scientific research skills, awareness of the societal and international position of pharmaceutical sciences, insight in follow-up master programmes and career opportunities and academic skills, among which communication skills, collaboration skills and information searching and processing skills.

Programme management presented the comparison of the intended learning outcomes to the Dublin descriptors for the bachelor level.



### *Consideration*

The panel considers the programme objectives to be very sound. The panel regards the programme profile to be very strong, the programme occupying a unique place among the programmes in this domain in the Netherlands and abroad.

The panel proposes for the programme to remain within this niche and not to broaden the programme. The panel suggests to consider renaming the programme to better reflect this profile. The panel advises to communicate more clearly the specific programme profile and features.

The panel characterises the programme as being geared toward the study of the chemical dimensions of drug discovery, especially in the first phases of the drug discovery and development processes. The panel regards the programme to be scientifically sound and up to date.

The programme objectives are within the boundaries of the domain-specific reference framework for academic chemical sciences programmes. The panel appreciates the efforts by the joint programmes in chemical sciences in the Netherlands to draft this framework and regards this to be a sound and up-to-date description of this domain. The programme profile may be clearly distinguished within the framework.

The panel welcomes the comparison to other programmes in the Netherlands, demonstrating the profile and the specific features of the programme.

The panel is positive about students being educated to enrol in various master programmes in this domain.

The panel suggests to intensify the interaction with the professional field advisory committee.

The intended learning outcomes of the programme correspond to the programme objectives, are well-articulated and are conform to the bachelor level.

### *Assessment of this standard*

These considerations have led the assessment panel to assess standard 1, Intended learning outcomes, to be good.

## 4.2 Standard 2: Teaching-learning environment

The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

### *Findings*

The number of incoming students in the last few years was on average about 70 students and varied to some extent, ranging from 50 students in 2017 to more than 80 students in 2015. The entry requirements are the secondary education (vwo) diploma, including courses on chemistry, physics and mathematics. Mathematics B is no prerequisite. Students not having taken mathematics B catch up in the first-year course Calculus. The vast majority of the students have the vwo-diploma. Students having completed the first year of their hbo-programme are admitted, provided they have taken the abovementioned vwo-courses. For prospective students, the programme schedules matching days. Students attend lectures, tutorials and practical courses on these days and are informed about the nature of the programme.

The curriculum of the programme takes three years, the total study load being 180 EC. Programme management presented a table, showing the mapping of the intended learning outcomes and the courses. The curriculum has been organised in seven learning pathways, being biochemistry/pharmacology, organic chemistry, theoretical chemistry, pharmacokinetics/molecular toxicology, bio-analytical chemistry, supporting courses, and academic skills and projects. All courses are part of one of these pathways. The first five learning pathways cover the domain-specific core courses and cover the core as described in the domain-specific reference framework. These courses address both theoretical and practical knowledge and skills. In the practical courses, students work on their personal practical skills. In the supporting courses, students study, among others, mathematics and statistics. In the projects, students work in groups on integrating and applying knowledge and skills in this domain. They study literature, analyse research papers and present their findings, thus contributing to their academic skills. Academic skills, such as presentation and writing skills, understanding literature, study planning and reflection skills are also addressed in the tutoraat, which runs through each of the years and is linked to the courses. Students take a 30 EC minor in the third year, allowing them to broaden or deepen their study or to obtain the second degree teaching qualification in chemistry. At the end of the curriculum, students complete the individual Bachelor research project (18 EC). Talented students with grade point averages of 7.5 or more, may take the honours programme, consisting of 30 EC of departmental and inter-departmental additional courses.

A total number of 34 lecturers are involved in the programme. The lecturers are researchers at one of the research groups of the Department of Chemistry & Pharmaceutical Sciences. These research groups are part of the Amsterdam Institute of Molecules, Medicines and Systems, which received scores excellent in the 2018 external research evaluation. Practically all staff members have PhDs. Of the total number of lecturers about 65 % obtained the BKO-certificate and another 15 % of them is expected to become BKO-certified in 2018/2019. Guest lecturers from industry teach in the projects. PhD students and postdocs are involved in the programme as teaching assistants and daily supervisors of Bachelor projects. Lecturers experience the work load as demanding, as the support by the central VU department diminished the last few years. Junior lecturers are recruited to alleviate lecturers' work load.

The educational concept is research-based education. The total number of hours of face-to-face education is on average 600 hours per year, leading to about 15 hours of face-to-face education per week. The study methods adopted in the programme are lectures, tutorials, practical courses, tutor groups and self-study. Educational innovation in the programme is pursued strongly, lecturers having adopted blended learning, web-lectures and flipped classrooms. Students use electronic lab journals in the practical courses. The programme is considering to introduce LabBuddy in these courses. The mean students-to-staff ratio proved to be difficult to compute. The number of students in the lectures are about 25 to 75 students per lecturer. In the tutorials and practical courses, the class sizes are maximum 25 students per teaching assistant. The number of students in the tutoraat-groups are 8 to 10 students. In these groups, students are guided by staff members as tutors. Students may also turn to the programme study advisor for study guidance, study skills and personal circumstances. In the first year and in line with the Binding Study Advice, students must obtain 42 EC. Students are informed about their study progress. The curriculum is demanding, but doable in the students' view. About 30 % to 40 % of the students drop out, mainly in the first year. The student success rates for the last years are on average 35 % after three years and 75 % after four years (proportion students re-entering in second year).

#### *Considerations*

The student inflow numbers of the programme are appropriate. The panel regards the entry requirements to be clear and relevant and the admission procedures, including the matching days, to be adequate. The profile and contents of the programme are clearly communicated to prospective students. The panel welcomes students not having taken mathematics B in their secondary education to be offered a course to remedy their deficiencies in this respect. The panel is positive about the contents of the curriculum. The curriculum meets the intended learning outcomes of the programme. The courses and projects are up to standard, with a pronounced and strong focus on chemistry subjects. The number of practical classes is adequate. The panel is positive about scheduling theoretical and practical classes in parallel. The panel is also positive about the breadth of the curriculum and considers the curriculum to be coherent. The number of electives students can choose from is adequate.

The panel regards the lecturers in the programme to be both skilled and motivated. In the panel's view, the lecturers know how to bridge the disciplines in the curriculum. The educational capabilities of the lecturers are up to standard, as may be deduced from the proportion of BKO-certified lecturers. As the workload is demanding for lecturers, the panel advises to balance the workload by providing more support from the Faculty departments and VU central departments.

The panel considers the educational concept and the study methods to be in line with the programme characteristics. The programme is working on new study methods, which is positive. The number of hours of face-to-face education and the class sizes are appropriate. The number of drop-outs in the first year is substantial, but the programme may be regarded to be quite demanding and the student-success rates are appropriate.

#### *Assessment of this standard*

These considerations have led the assessment panel to assess standard 2, Teaching-learning environment, to be satisfactory.

### 4.3 Standard 3: Student assessment

The programme has an adequate system of student assessment in place.

#### *Findings*

The programme examination and assessment procedures are aligned with the VU Amsterdam policies and the Faculty of Science policies. As has been indicated, the Examination Board for the programme has the authority to monitor the quality of examination and assessment processes and products. As the Faculty of Science is the outcome of the recent merger of two VU Faculties, there are still two Examination Boards in the Faculty. These boards are working to achieve one set of rules and regulations. The examination sub-committee for this programme specifically monitors the examinations and assessments quality.

The examination methods for the courses are selected in line with the courses' contents. In most of the courses, multiple examinations are scheduled to promote students study pace. The examination methods in the programme include written examinations, practical work in groups or individually, and group or individual reports and presentations. Free-riding in case of group work is countered by peer review among students, but this procedure has not yet been institutionalised.

The Bachelor project procedures are listed in the thesis manual. All projects are internships at one of the research groups contributing to the programme. External internships are in general not allowed for Bachelor projects. Students are guided by the supervisor. PhD students or postdocs may be involved in the day-to-day supervision. A go/no-go procedure in the first part of the projects has been implemented, to determine if students may proceed. The programme internship coordinator and research group coordinator oversee the process. Draft theses are discussed with the supervisors. Bachelor projects are assessed by the project supervisor and the second reader independently, using rubrics scoring forms. They meet to determine the grade. The assessment components are academic attitude, execution of the work, written report and oral presentation. To pass, all components have to be at least satisfactory. Part of the project is for students to make a poster presentation. The deadline for submitting the thesis is strict. In case the assessments of the examiners differ more than 1.5 points or in case one of the examiners judges the project to be unsatisfactory, a third examiner is called in and determines the grade. All theses are checked for plagiarism.

Programme management and the Examination Board have taken a number of measures to promote the quality of examinations and assessments. The Examination Board appoints examiners, in practice being the course coordinators. Draft examinations are peer-reviewed on both formal and material aspects. Examination matrices have been adopted. The validity of all multiple-choice examinations and of open-ended question examinations with deviant grade distributions are checked. On behalf of the Examination Board, the assessment committee on a regular basis reviews samples of examinations and samples of Bachelor theses.

### *Considerations*

The panel approves of the examinations and assessment rules and regulations of the programme, these being in line with VU Amsterdam and Faculty of Science policies.

The panel recommends to harmonise the rules and regulations of the two Examination Boards of the Faculty.

The panel approves of the examination methods adopted by the programme. The methods are consistent with the goals and the contents of the courses.

The supervision and assessment processes for the Bachelor projects have been well-organised. Students are offered appropriate supervision. The assessment procedures are up to standard, involving two examiners assessing the work separately and on the basis of rubrics scoring forms. Although the oral feedback by examiners on the Bachelor project results may be adequate, the panel suggests to provide more extensive written feedback.

The panel considers the measures ensuring the validity, reliability and transparency of examinations and assessments to be adequate.

### *Assessment of this standard*

The considerations have led the assessment panel to assess standard 3, Student assessment, to be satisfactory.

#### 4.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.
--

##### *Findings*

The panel studied the examinations of a number of courses of the programme.

The panel reviewed 15 Bachelor theses of programme graduates of the last two years. The average grade for the Bachelor projects was about 7.4 in the last four years.

In general, programme graduates do not enter the labour market. They proceed to master programmes in this domain. The master programmes chosen most often are the Master Drug Discovery and Safety programme of VU Amsterdam (65 %), the Master Chemistry programme of VU Amsterdam and University of Amsterdam (13 %) and the pre-master Pharmacy programme of Utrecht University.

##### *Considerations*

The panel considers the course examinations to include relevant questions and to be quite challenging.

The Bachelor theses the panel studied, match the intended learning outcomes and are appropriate scientific research projects. No theses were found by the panel to be unsatisfactory. The level and quality of the theses differ, which is reflected in the grades. The panel supports the grades given by the programme examiners.

The panel regards the programme graduates to have reached the intended learning outcomes and to be qualified to enrol in master programmes in this domain.

##### *Assessment of this standard*

The considerations have led the assessment panel to assess standard 4, Achieved learning outcomes, to be satisfactory.

## 5. Overview of assessments

Standard	Assessment
Standard 1. Intended learning outcomes	good
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Student assessment	satisfactory
Standard 4: Achieved learning outcomes	satisfactory
Programme	satisfactory

## 6. Recommendations

In this report, a number of recommendations by the panel have been listed. For the sake of clarity, these have been brought together below. These panel recommendations are the following.

- To remain within the current niche and not to broaden the scope of the programme.
- To consider renaming the programme to better reflect the programme profile.
- To communicate more clearly about the specific profile and features of this programme.
- To intensify the interaction with professional field advisory committee.
- To balance the workload of the lecturers by providing more support from the Faculty and VU central departments.
- To harmonise the examination and assessment rules and regulations of the two Examination Boards of the Faculty.
- To provide more extensive written feedback on the Bachelor project results.