

Assessment report
Limited Framework Programme Assessment
Bachelor Bio-Farmaceutische Wetenschappen
Leiden University

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1. Executive summary

In this executive summary, the panel presents the main considerations, which led to the assessment of the quality of the Bachelor Bio-Farmaceutische Wetenschappen programme of Leiden University. The programme was 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, published on 20 December 2016 (Staatscourant nr. 69458).

The programme objectives are sound. The panel regards the programme to be broad, introducing students to a wide range of subjects in the field of bio-pharmaceutical research. The panel welcomes the strong research orientation of the programme. Research is prominent in the programme, the programme being aligned with new scientific trends in these disciplines.

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 profile of this Leiden University programme can be clearly distinguished within the framework.

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

The panel welcomes students being educated to enrol in a wide range of master programmes.

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

The panel notes the number of incoming students to be very substantial. Although the intake numbers are managed satisfactorily, the panel advises to consider to limit the influx. Prospective students are well-informed about the programme. The entry requirements and admission procedures of the programme are appropriate.

The curriculum matches the programme intended learning outcomes. The contents of the curriculum are considered by the panel to be solid and up to standard. The curriculum coherence is promoted by the teaching-learning trajectories. The academic skills are well-represented. The panel understands the disciplinary knowledge and skills to remain fully lectured in the revised curriculum, which the panel considers to be very important.

The lecturers in the programme are reputed researchers. The panel considers their educational capabilities up to standard, given the proportion of BKO-certified lectures. The number of staff in the programme is sufficient. The panel welcomes the organisation of the programme with the core lecturing team and notes lecturers frequently discussing the programme.

The panel considers the educational concept of the programme and the study methods to be adequate, promoting research-oriented and student-activating learning processes. The number of hours of face-to-face education in the programme is up to standard. Given the growing increase in student numbers, the panel regards the streamlining of the programme to have been done well and appreciates the number of practical courses being upheld. The panel suggests to introduce the LabBuddy platform in the first year as well. The panel also proposes to rearrange the schedule of the Analytical Chemistry course, dividing the student group into two parts to resolve the capacity problems. The study guidance by the student mentors and study advisors is welcomed by the panel. The programme is feasible, but the panel suggests to monitor the study load in the second year. The student success rates are appropriate.

The examination and assessment rules and regulations for the programme are appropriate.

The examination methods adopted by the programme are consistent with the course goals and contents. The panel welcomes the procedures for the assessments of group projects to counter free-riding. The panel is positive about the usage of rubrics scoring forms to assess assignments and academic skills.

The panel welcomes students being offered two models to complete the Bachelor research assignments. The supervision and assessment processes for these assignments 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 elaborate rubrics scoring forms.

The panel considers the measures to ensure the validity, reliability and transparency of examinations and assessments to be adequate. The procedures have been implemented. The Board of Examiners is proactive in monitoring these and the examiners comply with these procedures.

The examinations of the courses are up to standard. The panel considers the final Bachelor research assignments to be at bachelor level and endorses the grades awarded to these assignments by the programme examiners.

The panel is convinced that students having completed the programme reached the intended learning outcomes and welcomes the range of master programmes the programme graduates are admitted to.

The panel which conducted the assessment of the Bachelor Bio-Farmaceutische Wetenschappen programme of Leiden University 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 recommends NVAO to accredit this programme.

Rotterdam, 7 March 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 Leiden University to support the limited framework programme assessment process for the Bachelor Bio-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).

Management of the programmes in the assessment cluster WO Scheikunde convened to discuss the composition of the assessment panel and to draft the list of candidates.

Having conferred with management of the Bachelor Bio-Farmaceutische Wetenschappen programme of Leiden University, 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. C.G. Kruse, special professor emeritus Medicine Research, University of Amsterdam (panel member);
- Drs. O. de Vreede, head Innovation and Human Capital, VNCI, Association of the Dutch Chemical Industry (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 has given the 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 fifteen 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 preliminary 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 11 October 2018, the panel conducted the site visit on the Leiden University 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, Board of Examiners members, lecturers and final projects examiners, students and alumni, and professional field representatives.

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.

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 Leiden University, to accompany their request for re-accreditation of this programme.

3. Programme administrative information

Name programme in CROHO: B Bio-Farmaceutische Wetenschappen (B Bio-Pharmaceutical Sciences)
Orientation, level programme: Academic Bachelor
Grade: BSc
Number of credits: 180 EC
Specialisations: Bio-Farmaceutische Wetenschappen
Farmacie (Pharmacy)
Location: Leiden
Mode of study: Full-time (language of instruction Dutch)
Registration in CROHO: 21PB-50207

Name of institution: Leiden University
Status of institution: Government-funded University
Institutions' quality assurance: Approved

4. Findings, considerations and assessments per standard

4.1 Standard 1: Intended learning outcomes

<p>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.</p>
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Findings

The Bachelor Bio-Farmaceutische Wetenschappen programme is offered by Leiden Academic Centre for Drug Research of the Faculty of Science of Leiden University. The dean of the Faculty has the responsibility for all programmes of the Faculty. Leiden Academic Centre for Drug Research offers the programmes Bachelor Bio-Farmaceutische Wetenschappen, Master Bio-Pharmaceutical Sciences and, in collaboration with Leiden University Medical Center, Master Pharmacy. The programme director of the Bachelor Bio-Farmaceutische Wetenschappen programme is responsible for the delivery and quality of the programme. The programme director is assisted by the core team of lecturers, who together take the responsibility of the organisation and revision of courses. The Programme Committee for both Bachelor Bio-Farmaceutische Wetenschappen and Master Bio-Pharmaceutical Sciences programmes, being composed of five lecturers and five students, advises programme management on quality issues. The Board of Examiners, also being authorised for both programmes, is responsible for ensuring the quality of examinations and assessments of the programme.

The Bachelor Bio-Farmaceutische Wetenschappen is a three-year, research-based, multi-disciplinary academic bachelor programme in the field of bio-pharmaceutical sciences, drug discovery and drug development. The programme is firmly rooted in the research done at Leiden Academic Centre for Drug Research. The objectives of the programme are to introduce students to the different stages of the drug discovery pipeline, encompassing pre-clinical drug discovery, drug development and drug testing, clinical trials and drugs approval and post-approval monitoring. The programme does not aim to teach students to develop drugs, but aims to educate them in the conceptual aspects of the drug discovery pipeline stages. To this end, students are offered knowledge of chemistry, biology and mathematics, are trained in practical laboratory and computational skills and are taught to integrate knowledge and skills. Students may select the Pharmacy specialisation, preparing them for Master Pharmacy programmes. Students having completed this specialisation not only meet the programme intended learning outcomes, but also meet the Dutch Pharmacy Framework bachelor programmes requirements.

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 Leiden University programme may be regarded to be positioned in the pharmaceutical sciences sub-domain of chemical sciences.

Programme management conducted a benchmark survey, comparing this programme with programmes in the Netherlands and abroad. From this comparison, this programme emanates as being broad, covering the drug discovery pipeline stages and introducing students to biopharmaceutical research at molecular, cellular, tissue and whole-organism levels.

The programme aims at preparing students for a wide range of master programmes, depending upon the electives and minor programmes to be selected. These master programmes are, among others, Bio-Pharmaceutical Sciences, Life Sciences, Chemistry, Biology or Biomedical Sciences, both within the Leiden University Faculty of Science or at other Faculties or Universities. The Leiden Academic Centre for Drug Research Advisory Board councils programme management on the alignment with professional field requirements.

The programme objectives have been translated into intended learning outcomes. These specify knowledge of and insights into basic subjects, current concepts and methods of drug research, understanding relations between sub-areas in this field, research skills, to be demonstrated under strict supervision, critically approaching and analysing scientific problem statements, reflection on scientific and social problems in this field, communication skills and self-development competences. Programme management compared the intended learning outcomes to the bachelor Dublin descriptors.

Consideration

The panel considers the programme objectives to be sound. The panel regards the programme to be broad, introducing students to a wide range of subjects in the field of bio-pharmaceutical research. The panel welcomes the strong research orientation of the programme. Research is prominent in the programme, the programme being aligned with new scientific trends in these disciplines.

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 profile of this Leiden University programme can be clearly distinguished within the framework.

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

The panel welcomes students being educated to enrol in a wide range of master programmes.

The intended learning outcomes of the programme correspond to the programme objectives. The panel regards the intended learning outcomes to be well-articulated. The intended learning outcomes 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 satisfactory.

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 programme about doubled from 147 students in 2012 to 291 students in 2016. Programme management succeeded in stabilising student influx numbers the last few years and wants to continue to stabilise these numbers. Students having completed their secondary education (vwo) are admitted, mathematics B not being an entry requirement. Before the start of the programme, prospective students take part in the matching procedures for the programme. In these procedures, students take online courses and tests, representative of the programme and submit their grades in previous education and their letter of motivation. Students are given advice on the basis of this information. In case of serious doubts, interviews are held.

The curriculum has a study load of 180 EC and takes three years to complete. Programme management presented a table, mapping the intended learning outcomes to the curriculum components. The curriculum is organised in five teaching-learning trajectories, being biology and (patho)physiology, chemistry and (biochemical) analysis, mathematics and computational skills, academic and research skills, and pharmaceutical drugs and drug innovation. In the biology and (patho)physiology trajectory, students acquire knowledge about the functioning of organisms at molecular, cellular and whole-organism levels. In the chemistry and (biochemical) analysis trajectory, the synthesis of drugs and their effect on molecular level and in the body are studied. In the mathematics and computational skills trajectory, students are acquainted with mathematical and computational models for drug research. In the academic and research skills trajectory, students are trained in academic and research skills and are informed about social and ethical aspects and career perspectives. The pharmaceutical drugs and drug innovation trajectory introduces students to the field of pharmaceutical drug innovation and may be seen to integrate the other trajectories. All courses are part of one of these trajectories. In addition, seven practical training courses are scheduled. All courses in the first two years are mandatory. In first semester of the third year, students take a minor. They may select minors of Leiden University or any other Dutch university, elective course packages offered by Leiden Academic Centre for Drug Research, the Pharmacy specialisation course package or courses abroad. At the end of the curriculum, students draft the Bachelor research assignment (16 EC). The last few years, courses underwent educational and content-related revisions. In the academic year 2019/2020 the curriculum will be revised fundamentally, to be organised in courses in which theory and practice are integrated.

About 30 staff members are involved in the programme as lecturers. All of them are actively engaged in current, international research in their fields. Most of them work at the Divisions of Leiden Academic Centre for Drug Research. A number of lecturers come from other institutes of the Faculty of Science, such as Leiden Institute of Chemistry, Mathematical Institute or Institute of Biology Leiden. Some lecturers have 50 % lecturing appointments, but are involved in research. The proportion of lecturers, with appointments of more than two year, being BKO-certified is about 84 %. Full professors teach in the first year of the programme. In addition to permanent staff, postdocs, PhD students and student assistants act as teaching assistants in workgroups and practical courses. External lecturers from Leiden University Medical Centre and other institutions are involved in the programme as well. Guest lecturers from industry highlight specific subjects. The core team of lecturers discusses the programme every three weeks. Twice per year all lecturers meet, discussing the programme and proposals for revisions, made by the core team. Although the workload is challenging, lecturers manage. The last few years, the organisation of the programme has improved. Students indicated to be generally content about the lecturers.

The educational concept of the programme is research-based learning and promotes students to actively engage in the learning processes. The number of hours of face-to-face education is on average about 20.0 hours per week for the first two years, about 30 % to 35 % of which constitute practical training. Study methods adopted in the courses are lectures, work groups, project-based learning, literature-based learning and self-study. Educational innovation is strongly promoted among lecturers, especially by the educational developers of the programme core team. Study methods adopted are blended learning and flipped classroom teaching. The LabBuddy platform is used in practical courses in the second year to the general satisfaction of both lecturers and students. In lectures and work groups, students are guided in groups of 8 to 12 students by teaching assistants under supervision of the lecturer. New facilities are available for the programme. In the first year, students are guided by student mentors and the programme study advisors in groups of about 15 students. Students draft their study plans for the second and third year. In these years, they may turn to the study advisors for assistance. The study load is experienced by students to be adequate, although they have difficulties to manage in the second year. In the revised curriculum, this is intended to be remedied. The student success rates are on average 48 % after three years and on average 76 % after four years (figures for last three cohorts). The mean study duration is 3.4 years.

Considerations

The panel notes the number of incoming students to be very substantial. Although the intake numbers are managed satisfactorily, the panel advises to consider to limit the influx. Prospective students are well-informed about the programme. The entry requirements and admission procedures of the programme are appropriate.

The curriculum matches the programme intended learning outcomes. The contents of the curriculum are considered by the panel to be solid and up to standard. The curriculum coherence is promoted by the teaching-learning trajectories. The academic skills are well-represented. The panel understands the disciplinary knowledge and skills to remain fully lectured in the revised curriculum, which the panel considers to be very important.

The lecturers in the programme are reputed researchers. The panel considers their educational capabilities up to standard, given the proportion of BKO-certified lectures. The number of staff in the programme is sufficient. The panel welcomes the organisation of the programme with the core lecturing team and notes lecturers frequently discussing the programme.

The panel considers the educational concept of the programme and the study methods to be adequate, promoting research-oriented and student-activating learning processes. The number of hours of face-to-face education in the programme is up to standard. Given the growing increase in student numbers, the panel regards the streamlining of the programme having been done well and appreciates the number of practical courses being upheld. The panel suggests to introduce the LabBuddy platform in the first year as well. The panel also proposes to rearrange the schedule of the Analytical Chemistry course, dividing the student group into two parts to resolve the capacity problems. The study guidance by the mentors and study advisors is welcomed by the panel. The programme is judged feasible, but the panel suggests to monitor the study load in the second year. 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.
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Findings

The examinations and assessments in the programme are governed by the Examination Rules and Regulations for the programme and correspond with the Faculty of Science rules and regulations. The Board of Examiners has the authority to ensure the quality of the examinations and assessments of the programme.

The examination methods in courses are written examinations, oral examinations, written assignments, presentations and participation in class discussions. In most courses, multiple examinations are scheduled. For assessing written assignments and academic skills, rubrics scoring forms have been adopted. In group projects, assessments take individual performances of students into account and allow for differentiated grading of group members.

Topics for the final Bachelor research assignments are presented by staff members at scheduled events. For these assignments, students may choose either the Research Project variant or the Research Proposal variant. Both variants cover the entire empirical cycle. The Research Project requires students to address research questions by means of laboratory experiments or computational work, and to present the results in scientific paper form. In the Research Proposal variant, students define knowledge gaps, study extensive literature, formulate research questions, draft experimental or computational frameworks and derive results, supported by pilot data. Students are entitled to individual supervision. Students submit the written thesis of this work and defend it in an oral presentation. Two examiners assess the Bachelor research assignments independently, using rubrics scoring forms for their assessments. The rubrics forms include a number of relevant assessment criteria. Should their assessments differ more than 0.5 point, a third examiner is called in.

In the programme, measures have been taken to ensure the validity, reliability and transparency of examinations and assessments. In the recently drafted programme assessment plan, the examinations in the courses and the course goals have been related to the intended learning outcomes. All examination drafts are peer-reviewed by fellow examiners. Examiners make use of test matrices for the examinations and include answer models. The Board of Examiners reviews samples of course examinations and samples of Bachelor research assignments. All of these assignments are checked for fraud and plagiarism. Cases are dealt with by the Board of Examiners.

Considerations

The examination and assessment rules and regulations for the programme are considered by the panel to be appropriate.

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 panel appreciates the procedures for the assessments of group projects to counter free-riding. The panel is positive about the usage of rubrics scoring forms for assignments and academic skills assessments.

The panel welcomes students being offered two models to complete the Bachelor research assignments. The supervision and assessment processes for these assignments 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 elaborate rubrics scoring forms.

The panel considers the measures to ensure the validity, reliability and transparency of examinations and assessments to be adequate. The procedures have been implemented, examiners comply and the Board of Examiners is pro-active in monitoring these.

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.
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Findings

The panel studied a number of course examinations.

The panel reviewed the Bachelor research assignments of fifteen graduates of the programme with various grades. In these projects, students are expected to demonstrate, among others, to do literature reviews, draft hypotheses, plan the work, perform practical implementations, and report and present the results.

Practically all graduates proceed to master programmes. Only rarely, graduates enter the labour market. The panel notes slightly less than 60 % of the programme graduates proceeding to the Leiden Master Bio-Pharmaceutical Sciences programme. About 15 % of the graduates go to the Leiden Master Pharmacy programme. Others go to other Leiden University master programmes. About 12 % leave Leiden, mainly to enrol in programmes of other Universities.

Considerations

The examinations of the courses studied by the panel are up to standard.

The panel considers the Bachelor research assignments to be definitely at bachelor level. The panel endorses the grades awarded to these assignments by the programme examiners.

The panel is convinced that students having completed the programme reached the intended learning outcomes and welcomes the range of master programmes the programme graduates are admitted to.

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	Satisfactory
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.

- To consider limiting the influx of students.
- To introduce the LabBuddy platform in the first year as well.
- To rearrange the schedule, dividing the student group into two parts to solve the capacity problems in the Analytical Chemistry course.
- To monitor the study load in the second year of the curriculum.