

Hogeschool van Arnhem en Nijmegen

B Chemie/Chemistry

and

**B Biologie en Medisch Laboratoriumonderzoek/Biology
and Medical Laboratory Research (BML)**

Update assessment B Chemie parttime

Limited study program assessment

006A2022.07

Summary

In September 2022, the existing hbo bachelor's programs Chemie/Chemistry and Biologie en Medisch Laboratoriumonderzoek/Biology and Medical Laboratory Research (Life Sciences) further on abbreviated to Chemie and BML referring to both the Dutch and English variant of both programs unless explicitly otherwise specified of The University of Applied Sciences of Arnhem and Nijmegen (HAN) were visited by an NQA visitation panel. Both Chemie and BML provide a four-year fulltime program. The Chemie program also provides a six-year program in a flexible part-time variant in Dutch. The panel assesses the program of Chemie and BML as a whole as **positive**.

The panel has met two bachelor study programs that work consciously on the deliverance of good education and well qualified graduates for the professional field. This is made possible by the close connection to and the extensive network with the professional field. the panel finds it positive that both programs have opened the doors for participation of professionals in the educational program. The staff is well qualified and dedicated. This is acknowledged by the students.

Standard 1: Intended learning outcomes

The Chemie and BML programs **meet** the basic quality for this standard. The panel notes that the program profile drawn up by the programs is based on the national competency-based profile description of the Bachelor of Sciences. The competences have been elaborated with indicators in the *Training Competence Profile Chemie and BML*. The panel concludes that the programs' profiles are in line with the requirements of the (international) professional practice. The developments in the field are aligned with the programs in various ways. Alumni are involved in the programs and provide up-to-date input. The panel concludes that the programs maintain an excellent connection with professional practices and therefore have and keep a good, up-to-date picture of professional practices.

Standard 2: Teaching-learning environment

The Chemie and BML programs **meet** the basic quality for this standard. The panel notes that the programs have designed their programs in such a way that students are able to obtain the final qualifications. The panel notes that professional practice is involved in the educational courses in various ways. The casuistry is always a current research project directly from the professional practice, or derived from the professional practice. Moreover, the Lectorates, affiliated with the HAN BioCentre, are well involved in the training courses. The panel notes that the international character of professional practice has a clear place in the programs. The panel believes that the programs have an expert and dedicated teaching team. Students are very satisfied with their lecturers, whom they find enthusiastic and involved. The specific facilities are up-to-date, relevant and modern.

Standard 3: Assessment

The Chemie and BML programs **meet** the basic quality for this standard. The panel concludes that the described test policy is sufficiently clear and is in line with the HAN-wide assessment policy. The test system fits in well with this and is based on the test policy. The panel also believes that the final assessment is of the desired (final) level. The panel considers the assessment of the tests and final works to be sufficient and agreed with the given grades of the

tests and final works. The panel considers the assurance of testing to be sufficient, and it compliments both Chemie and BML on the wide range of actors involved.

Standard 4: Realized learning outcomes

The Chemie and BML programs **meet** the basic quality for this standard. The panel notes that the programs demonstrate that the intended learning outcomes are being achieved. The panel bases this mainly on the final works (part-time and full-time), which are certainly at professional bachelor level. The panel believes that the programs produce professionals who function well in the professional field and believes that the programs are and remain well informed about the functioning of graduates.

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Introduction

This visitation report contains the assessment of the existing hbo bachelor's programs Chemie and BML of the HAN. The NQA visitation panel that carried out the assessment was put together by NQA, on behalf of the HAN and in consultation with the program. Prior to the visitation, NVAO approved the panel.

The report describes the panel's findings, considerations and conclusions. It also contains some recommendations for both Chemie and BML. The report has been drawn up in accordance with NVAO's *Assessment Framework for accreditation system for higher education* (2018), the protocol *Accreditation assessment of programs with experimental variants* (NVAO, 2021) and the *Manual for Higher Education Training Reviews, Limited Training Assessment* (NQA, 2019).

The visitation took place on 20 September 2022. The visitation panel consisted of:

Mr. prof. J.T.P. (Hans) Derksen (chairman, domain expert)

Mr. dr. E.R. (Edwin) Kellenbach (domain expert)

Mrs. ing. M. (Mieke) Demeyere (domain expert)

Mr. M. (Mark) Delmartino (expert special feature Internationalisation)

Mrs. M. (Michelle) Voss (student member)

Ms. ir. M. (Marga) Dekker-Joziassse (lead-auditor) and Mr. R.H.W. (Rogier) van de Hoef MEd, both senior auditors of NQA, acted as auditors of the panel.

The Chemie and BML programs are classified in the HBO Life Science & Chemistry visitation group, with a deadline return date of 1 May 2023. Coordination between all sub-panels in this group has taken place first of all through the instruction that the panel members receive with regard to the assessment framework. The criteria calibrated between Hobéon and NQA for the assessment are part of this instruction. Prior to this, the coordination is guaranteed by overlap in the occupation between all sub-panels. In addition, taking into account the fact that each assessment is an individual assessment, from the overlap in the occupation, where relevant, has been progressively reflected on previous visits within this visitation group. The coordination between the panels is further ensured by the support of, as much as possible, the same secretary from NQA and other evaluation agencies and by the use of trained chairmen.

Working method panel and process progress

For this visitation a joint self-assessment with annexes was offered. For the assessment of the realized learning outcomes, the panel studied fifteen graduation products of recent graduates per program. These products have been selected on the basis of lists of alumni from the past two years. The selections take into account the variation in student evaluation, program variants and study routes. The selection of chemistry graduation files contains four files of the flexible part-time variant for the update assessment of this study route (see appendix 2).

Central to the assessment was the visit of the panel, consisting of expert peers. Two weeks prior to the visitation visit, the preliminary consultation and material study took place at the HAN-location during a so-called agenda-setting audit. In the consultation, the panel members were instructed about the working methods of NQA and the NVAO framework and preliminary findings were discussed. Both during the preliminary consultation and during the visitation, findings were continuously shared. During the audit visit, the panel discussed various stakeholders of the

program, including students, lecturers (examiners) and representatives of the professional field and studied the material made that was available for inspection (see appendix 2). At the end of the audit visit day, the information obtained by the panel was processed into an overall picture and into a preliminary judgment with argumentation. During a final oral feedback, the chair of the panel communicated the final verdict and important findings to the programs. The development interview will take place online at a later date. Staff and students of the programs were given the opportunity to approach the panel (via e-mail) outside the visiting day (the so-called walk-in consultation hour). No one has used this opportunity.

After the audit visit, a draft report was drawn up, which was submitted to the panel. With the input of the panel members, a second draft was drawn up, which was submitted to Chemie and BML for checking for factual inaccuracies. The panel members have taken note of the response of the program and, where necessary, adjustments have been made. The report was then finalized. With all the information provided (oral and written), the panel was able to reach an informed opinion.

The visitation panel declares that the assessment of the educational programs Chemie and BML has taken place independently.

Utrecht, 2 February 2023

Panel Chair



prof. J.T.P. Derksen

Lead Auditor



ir. M. Dekker-Joziase

Characteristic features of the study program

In recent years, the School of Applied BioSciences and Chemistry (SABC) has experienced a growth in student numbers. Part of the growth lies in the new English-taught language Chemie degree program, which will enter its fourth year in September 2022. This year, 40 students enrolled in the Dutch taught program and 40 students in the English taught program. However, most of the growth is caused by an increase in the number of students in the English taught BML degree program. There are 175 BML-students in the English variant enrolled this year. In order to cope with this growth, a relatively large number of new colleagues have been hired in recent years, including various international colleagues. SABC trains students for the Bachelor's programs BML, Chemie and Bioinformatics¹. Each program consists of a major of 210 ECTS and a minor of 30 ECTS. These bachelor's degree programs are offered in the variants:

- Full-time education Dutch: Chemie, BML and Bioinformatics
- Full-time education English: Chemie (Chemistry), BML (Life Sciences, abbreviated to LS)
- Part-time/e-learning Dutch: Chemie, specialization Analytical Chemistry

SABC works closely with ROC Rijn IJssel (mlo education). Facilities are shared and there is cooperation in the design of the mlo-hbo transfer program, in which students from ROC de Leijgraaf also participate. The HAN BioCentre and the affiliated Lectorates work closely with the professional field on applied research. The HAN BioCentre has been further developed into a Centre of Expertise (CoE) for Biotechnology and Analysis with various expertises such as fermentation technology, analytical chemistry, molecular chemistry biology, microbiology and bioinformatics. Based on these expertises, the HAN BioCentre conducts practice-oriented research together with the programs of SABC (lecturers and students), the business community and other knowledge institutions.

The mission of the degree programs is that they train students to become competent Bachelors of Science, who work in laboratories and related fields of profession and who are both expert professionals and responsible citizens. In addition, Chemie and BML prepare students for possible transfer to various further education courses, for example, (university) master's programs. The degree programs do this by tailoring their programs to the current and future demands of the international professional field and society.

BML prepares students for a broad role in conducting fundamental and applied research and the research related to it. The program prepares the students, among other things, to carry out fundamental and applied research. For both types of research, the competences 'design of experimental setup', 'experimenting' and 'result analysis' are of great importance. These three core competences are intensively practiced and tested. The other competences are frequently practiced, with a focus within an educational unit on a number of these competences. The internship of the program concerns a research assignment in the professional field; students are mainly tested on the quality of 'Experimentation'. In the graduation project, all students individually demonstrate the competences that belong to conducting scientific research.

¹ This report covers the audit and assessment of the Chemie, BML and part-time Chemie degree programs.

In the professional practice of the graduate of the Chemie program, the emphasis is on analytical chemistry and organic & polymer chemistry, with an emphasis on applied research. In addition, fundamental research also plays an important role. For both types of research, the competences 'design of experimental setup', 'experimenting' and 'result analysis' are of great importance (core competences). This is reflected in the design of the educational units. These three core competences are intensively practiced and tested. The other domain-specific and hbo-specific competences are frequently practiced, with a focus on a number of these competences within an educational unit. The internship concerns a research assignment in the professional field; students are mainly tested on the quality of 'Experimentation'. In the graduation project, all students individually demonstrate the competences that belong to conducting scientific research.

Basic Data of the Study Programme

Name of training in Central Higher Education Register Education (CROHO)	Chemistry	Biology & Medical Laboratory Research
ISAT code CROHO	34396	34397
Orientation and level of training	Hbo	Hbo
Level of training	Bachelor	Bachelor
Degree	Bachelor of Science	Bachelor of Science
Number of credits	240 ECTS	240 ECTS
Variant(s) incl. a possible. 3-year trajectory for VWO at a hbo bachelor's program	Full-time Part-time flex	Full-time Part-time has been phased out, no more students in September 2022.
Specializations	- Analytical chemistry - Organic and Polymer Chemistry	- Biotechnology - Molecular Plant Biology - Biomedical Research: · Molecular pathogenesis · Neuroimmunology (2023)
Training location	Nijmegen	Nijmegen
Teaching	Full-time: Dutch and English Part-time: Dutch	Dutch and English
Special feature	Internationalisation, in separate report ECA	Internationalisation, in separate report ECA

Review of the previous visitation

During the previous visitation in 2016, the panel made some recommendations. Below is described how the Chemie and BML programs have acted on these recommendations.

Standard 2

The previous panel advised to join with more professorships of the HAN. In the meantime, a second Lectorate (Drug Discovery) has been added to the academy. The BioBased Innovations and Drug Discovery Lectorates are affiliated with the HAN BioCentre. In addition, collaborations with Lectorates have been set up in recent years, several Lectorates have been involved in the multidisciplinary minors. Within the Sustainable Energy & Environment axis, activities are being developed in the context of sustainability. The driving force behind this HAN Biocentre is also a lecturer in the Biobased Innovations research group. Within this line of research Chemie and BML are particularly well connected.

The previous panel also advised to remain vigilant for the workload that students experience. In the new first semester, the student workload is more spread over the entire semester. Furthermore, first steps have been taken towards the new assessment policy at several places in the curriculum. Examples are the reduction in the number of tests, the spread of practica and that end products are a more logical consequence of previous work. In year 2 of the Chemie, mathematics has been adapted and integrated in other courses as of 2022-2023, with more emphasis on the implementation of mathematics. In addition, during a number of class representatives meetings, attention was paid to the experienced study pressure. Many course evaluations address how students have experienced the distribution of the study load, so that course leaders can take action on this if necessary.

The panel also advised to continue to actively evaluate the workload for lecturers, in view of the further expected growth of the programs. This recommendation has been taken up in several ways. For example, there is a HAN-wide project 'from work pressure to job satisfaction'. A survey was carried out in corona time of which the outcomes were discussed in team meetings. An HRM student conducted a study. A study on time writing for testing has been carried out, course-coordinating hours have been adjusted and training hours are available for new lecturers. Work pressure remains an important point of attention. An action plan has been drawn up in which the results of the "2022 employee survey" and the policy 'from work pressure to job satisfaction' have been combined.

Standard 3

The previous panel recommended designing more compact assessment forms and creating space for notation of more personal feedback towards students. Elements of the test policy plan have now been implemented. For example, in the main phase of the assessment of practice, a single point rubric is used, whereby not each competence is graded separately, but where several competences are assessed in conjunction and more feedback is given to the student. This set-up will also be used for the measurement reports in year 2 at Chemie. Eventually, more and more assessment forms will look like this. Attention though, is increasing for giving feedback. For example, several academy-wide study days have been dedicated to the importance of giving feedback.

Standard 4

The previous panel recommended that contact with alumni could be further formalized. Since then, an alumni association has been established: HANalyst. This was active, but in corona time little could be organized. This will be picked up again and it is also an important issue in the policy plan "*Heading HAN 2022-2028*" (Dutch: Koersbeeld).

The previous panel also advised to use the remarks field on the assessment form more actively so that afterwards it remains clear what the motives of those involved were for their judgements. The programs have taken up this recommendation by encouraging internship coordinators to use the remarks field more. In one of the calibration sessions concerning internship / graduation, attention was recently drawn to this again. The remarks field is now used more, but not yet structurally (see: Standard 3). The assessment forms are now set up in an online application (Handin) and it has become easier to use this field. The programs want to make more structural use of this.

Assessment of NVAO standards

Standard 1 Intended learning outcomes

The intended learning outcomes fit the level and orientation of the program and are tailored to the expectations of the professional field and the field of study and to international requirements.

Conclusion

The Chemie and BML programs **meet** the basic quality for this standard.

The panel notes that the program profiles drawn up by the Chemie and BML programs, with the implemented Body of Knowledge and Skills (BoKS²), is based on the national competency-based profile description of the Bachelor of Sciences. The program profile has been drawn up in consultation with the department advisory council (AAR) and the professional field committee (BVC), validated by the professional field. The HAN Chemie and BML programs have decided to arrange certain competences differently from the national profile. As a result, the local coloring of the program, in which the emphasis is mainly on conducting research, comes to the forefront more clearly. As a result, the programs have more training competences than are described in the national profile. The competences have been elaborated with indicators in the *Training competency profile BML and Chemie*. Some international and intercultural aspects were made more explicit in the competence profile. The panel concludes that the training profile demonstrably matches the requirements of (international) professional practice.

The programs keep track of developments in the field in various ways. External experts in the AAR and BVCs are very active and constantly bring in the latest developments from the professional field. A number of lecturers have a part-time appointment and also work in the professional field. Lecturer-researchers teach and work at one of the Lectorates. These employees can translate the developments from the research into education like no other. The programs are well represented in the national consultations and external examiners from other Universities of Applied Science are active in the assessment of graduate's reports. Finally, Alumni are involved in the programs and provide up-to-date input. An alumni association HANalyst has been founded. The panel notes that the programs have an excellent connection with professional practice and therefore have a good, up-to-date picture of professional practice.

Substantiation

Professional image/Professional profile

The panel concludes that the Chemie and BML programs lead to competent Bachelors of Science in the applied science domain, who are not only expert professionals but also responsible citizens. The activities of the graduated Bachelor of Science in Chemie or BML consist of working independently and/or in a team on research assignments in the biological, medical and chemical fields. Although the field of work of graduates is broad and diverse, BML and Chemie graduates focus on solving problems in the field of the natural sciences through (mostly experimental) scientific research in the laboratory. The use of advanced and often automated equipment and information technology is becoming increasingly important. The panel notes that the central professional task is recognizably reflected in the curricula of both programs in different professional contexts.

² Body of Knowledge and Skills is described at national level

In addition, the programs prepare students for transfer to various follow-up programs such as (professional) master programs. By creating social awareness during their studies and acquiring skills to develop sustainably, the aim is that they can continue to contribute to innovations in a complex, dynamic and international society in their working lives. Since the students are prepared for intercultural collaborations in an internationally oriented labor market, the programs in both the Dutch and English pay attention to intercultural competences and internationally accepted standards.

Targeted learning outcomes

In consultation with the national and regional professional field, the Applied Sciences Domain (DAS) has drawn up a national competency-based profile description of the Bachelor of Sciences. The described competences together with the BoKS are characteristic of the courses within the domain and apply to all variants. The document has been validated by the professional field and adopted by the board of the Association of Universities of Applied Sciences. Based on this national profile, the HAN Chemie and BML programs have drawn up their own profile, in consultation with the department advisory council (AAR) and the professional field committee (BVC). The national competence set is still leading, but certain competences have been re-named or split up. As a result, the 'couleur locale' of the program, in which the emphasis is mainly on conducting research, comes to the forefront more clearly. The panel clearly recognizes this. As a result, the programs have more emphasis on research training competences than are described in the national profile. This fits with the above described professional profile.

The national profile does not contain specific international or intercultural competences, but many aspects in the professional field are certainly internationally oriented. For example, think of the scientific literature used, the use of internationally accepted standards and the international context of the professional field. That is why it was decided to make some of these international and intercultural aspects explicit in the competence profile and the more specific underlying learning outcomes.

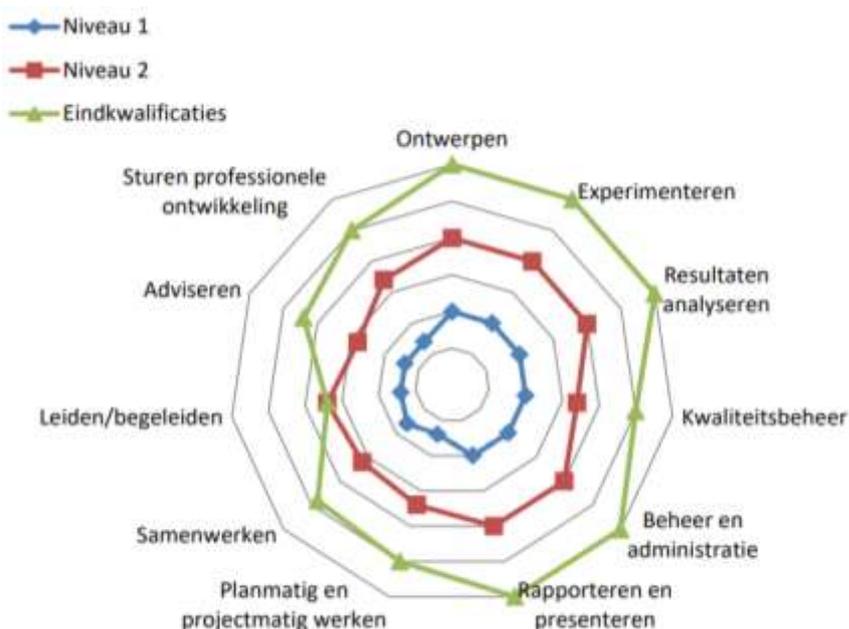


Figure 1: Concentric structure of competence development throughout the curriculum

The eleven competences for the Chemie and BML programs are: 1. Design of experimental setup, 2. Experimenting, 3. Analyzing results, 4. Quality management, 5. Management and Administration, 6. Reporting and presenting, 7. Systematic and project-based work, 8. Working together, 9. Leadership/Guiding, 10. Advising and 11. Steering Professional Development. The competences at the highest level (level 3, figure 1) are the final qualifications of the programs. For both programs the competences 'designing experimental design', 'experimentation' and 'result analysis' are the core competences that have to be obtained at level 3 ('couleur locale').

The competences have been elaborated with indicators in the *Training Competence Profile BML and Chemie*. In the matrix "*Comparison competency profile for BML and Chemie*", the panel has seen the relationship between these competency profiles and the national competency profile. This is also well described in the study guides for BML and Chemie. The panel finds that these comparisons show that the competence profiles of Chemie and BML are in line with this national competency profile and have their own accents (a 'couleur locale').

The panel notes that the BoKS of Chemie and BML are visibly derived from national framework documents and that the competences are easily calibrated with the internationally established Dublin descriptors for the bachelor's level. As a result, it is guaranteed nationally and internationally that the courses are of the right level and content. The panel therefore notes that the final qualifications of Chemie and BML also adequate. The national competence sets and profile descriptions are currently being revised and published. The programs are active in the various national consultations and follow the developments in this area. As soon as adjustments have been made to the national competence sets and profile descriptions, these are translated back into the program's profiles and competences.

Aligning (international) professional field

The panel concludes that the program profile is demonstrably in line with the requirements of (international) professional practice. The programs make use of international professional literature and the research is carried out in accordance with internationally applicable rules and agreements. In addition, the programs test the international level and content of their programs by involving employees of foreign (applied) universities in the assessment of the final works by their students.

The programs keep track of the developments in the field in various ways. External experts in the AAR and BVCs are very active and constantly bring in the latest developments from the professional field, so that the courses are very strongly connected to this field of work. The panel finds this positive. Lecturers have a good connection with practice. Almost all have relevant work experience and extensive networks in the relevant field. Almost all of them supervise interns and graduates, visit them at their workplace and see the new developments there. A number of lecturers have a part-time appointment and also work in the professional field. Lecturer-researchers teach and work at one of the professorships. These employees can translate the developments from the research into education like no other.

The hybrid learning environments at the Pivot Park in Oss and IPKW³ in Arnhem also provide a particularly valuable connection with other universities of applied sciences, other HAN programs and the professional field. Both programs are well represented in the national consultations DAS (Domain of Applied Sciences), LOBEM (in Dutch: Landelijk Overleg BML opleidingen) and LOCH (in Dutch: Landelijk Overleg Chemie opleidingen). Part-time students work in a relevant

³ Industry Parc Kleefse Waard

environment and from there bring information about the latest state of affairs. Finally, alumni are involved in the programs and provide up-to-date input. In addition to maintaining informal and individual contacts, Chemie and BML also have alumni policies since 2016. This has resulted, among other things, in the establishment of alumni association HANalyst. The panel concludes that Chemie and BML have and maintain an excellent connection with professional practice and therefore have a good image of professional practice. Moreover, Chemie and BML maintain good and structural contact with their alumni.

Signals from the various stakeholders come together in course leaders meetings and departmental meetings. The panel believes that with the above connections and the expertise of the employees, the programs are well able to identify developments early. Because the field is subject to rapid (technological) developments, it is a challenge for the programs to determine what will and what will not be included in the curriculum. In general, the reactions of the professional field to the functioning of the students are very positive.

In addition to a good preparation for the profession, Chemie and BML want to offer their students the opportunity to develop further through further education. Vertical comparisons of the final qualifications of Chemie and BML with the final qualifications of the professional Master's program Molecular Life Sciences (MLS) of the HAN, and the University Master's program in Biology of Wageningen University, show that the qualification profiles fit well together. An international benchmarking was carried out with the Bachelor's program Applied Biology of the cooperation partner Hochschule Bonn-Rhein-Sieg. This shows that the occupational and educational profiles are similar, with Chemie and BML placing more emphasis on developing interpersonal skills.

Flex part-time Chemie update

For the part-time program, the set of competences, together with the BoKS, has been elaborated in units of learning outcomes (EVL). The EVL's are drawn up according to the Tuning methodology. Research skills and theoretical knowledge are very important for the functioning of a professional. The part-time Chemie program is satisfied with the units of learning outcomes. They are clearly derived from the national set of competences and the BoKS and they demonstrably meet the requirements of international professional practice. They meet the bachelor level; they are easy to translate back to the Dublin descriptors. The panel endorses the opinion of the previous panel and believes that the part-time Chemie program **meets** the basic quality for this standard.

The previous panel advised to develop even more joint learning outcomes and modules within the Faculty of Technology based on the vision of multidisciplinary, in line with the intention of the Chemistry program. No joint learning outcomes and modules have been developed since the previous visitation. The reorganization of HAN, as a result of which there are no more faculties since January 1st, 2020, followed shortly thereafter by the corona pandemic and a long period of (partly) working from home, has made the connection with the other bachelor programs more difficult in recent years. Moreover, all the energy was needed to keep the current education running. The joint module professional skills is still offered.

The previous panel advised the program to better show how the vision of flexible education has been translated into the program. On this topic there is a lot in people's minds and until recently much knowledge was concentrated in the part-time coordinator. Make that explicit better and make it more transparent, the panel recommended. The *HAN 2022-2028 Course Chart* includes the strategic goal to make education more flexible. As part of this, for example, systems are set up at Academy level to facilitate student routes with individual choices in study routes. This way, all SABC degree programs benefit and can align their actions to the Academy Plan 2023-2025.

The previous panel found that the part-time program is still closely related to the larger full-time program. Recommendations were to keep an eye on the specific needs of the part-time programs and make sure that there is sufficient 'status aparte' and to keep an eye on the regulations of the HAN which sometimes do not seem appropriate for part-time programs.

It is now widely recognized that it is essential to continue to develop students for a lifetime of learning. Partly because of this, part-time programs, including Chemie DT, have come into better focus with both students and colleagues. Nevertheless, it remains a relatively smaller-sized program and (HAN) procedures and systems are often geared to the larger population of full-time students and programs. In times of corona, it became clear once again that part-time programs and students have specific needs that are sometimes different from full-time programs and students, if only because they are in a completely different situation and stage of life. At SABC, the SLB⁴ employee looks at what part-time students need in order to start studying again and makes individual agreements about this with the students that are recorded in personal study plans. In addition, Chemie conveys the flexible nature of the education in information materials and consultations.

⁴ SLB is a specific study counselor

Standard 2 Teaching-learning environment

The program, the teaching environment and the quality of the teaching team make it possible for the incoming students to achieve the intended learning outcomes.

Conclusion

The Chemie and BML programs **meet** the basic quality for this standard.

The panel notes that the programs have designed their programs in such a way that students are able to obtain the final qualifications. In addition, students receive different types of guidance in different learning environments. The panel notes that professional practice is involved in the OWE's in various ways. The casuistry is always a current research project from professional practice, or derived from professional practice. Moreover, the Drug Discovery and Biobased Innovations research groups (Lectorates), affiliated with the HAN BioCentre, are well involved in the courses. There is a good interaction and exchange between the study programs and the Lectorates, according to the panel. Chemie and BML graduates often end up in research groups at universities, companies or hospitals that are characterized by international research teams or international collaborations. The panel notes that this international character of professional practice has a clear place in the educational programs of Chemie and BML. As a result, students are well prepared for professional practice and are sufficiently equipped to work in the international work field. The panel believes that the programs have an highly qualified and dedicated teaching team. Students are very satisfied with their lecturers, whom they find enthusiastic, involved and easy-to-approach. The panel compliments the programs on their program-specific facilities. These are up-to-date, relevant and modern. The panel believes that this enriches the learning environment and enables the students to obtain their final qualifications.

Substantiation

Structure and content of the program

Knowledge & Professional Skills

The panel sees that the educational model (see: didactic concept) has led to educational units in which a professional task in the context of a relevant theme from professional practice always is the central starting point. In an Education Unit (Dutch: OWE), students acquire knowledge and skills that are discussed in the context of the theme. They do this by working on theoretical and practical assignments, individually or in groups. For example, they have weekly tutor meetings in which they work out assignments in groups; partly on the basis of professional literature. These tutor meetings have a meeting structure with chairman and note-taker, and also facilitate the development of interpersonal skills. For this collaborative learning to succeed, it is necessary that the students have a number of basic skills, such as discussing, independently consulting sources, etc. The students are guided in this by the tutor and follow specific skills training such as communication and conflict management. There are also the so-called "expert hours". An expert supports in the ongoing supervision of the assignments. During the expert hours, students can ask questions about all parts of the teaching unit.

For the professional task 'Conducting scientific research', preparing, carrying out and analyzing experiments in the laboratory is important. These competences are practiced while students carry out experiments in the laboratories, keep a lab journal about this, and/or write measurement

reports and reports about this. The practical assignments are as close as possible to the content of the tutor assignments. Students are supervised in practice by practical lecturers. Through the theory lessons, students mainly receive support in acquiring knowledge that is related to the theme as much as possible. Theory lessons are lectures or interactive meetings in which the new subject matter can be applied directly. Workshops and skills trainings are organized to teach students skills with regard to the general hbo competences such as communication, coaching and conflict management. These workshops and skills trainings can also be organized around the teaching of vocational skills, such as a bioinformatics training for BML students or around certain research skills, such as scientific reporting.

As mentioned the coherence within a OWE is organized around a theme. At the beginning of the teaching unit, they are presented with a case with one or more research questions. Through natural-scientific research, both theoretically and in practice, students look for answers to the question/problem. Theory lessons and skills trainings are as much as possible substantively related to the case, so that educational units form a substantively coherent, professionally related whole. Students have indicated that they greatly appreciate this. They are very satisfied with the content and level of the program and OWE's.

The vertical coherence in the educational program is characterized by a step-by-step construction of the mastered competences, knowledge and skills from the starting level to level 1, 2 and the final level 3. In addition, the competence development during the curriculum is concentric: all competences are developed at each level. The level of the competences increases in the course of the educational program; see Figure 1. This shows that the emphasis of the education programs is on the development of competences that directly relate to the research skills. A higher level of competence is characterized by the amount and complexity of knowledge and skills that the student must apply integrally (= complexity of case studies), and the degree of independency required.

In order to realize the build-up in the complexity of assignments and independence in the different levels, different forms of education are applied. In the first year, assignment-based education is started, in which the student receives (partial) assignments with which he/she carries out the central assignment. These weekly sub-assignments have been worked out concretely with a number of sub-questions. Students work in small groups or individually. At the end of the week, the results are discussed with fellow students and the tutor. Step by step, the student learns to work towards the end result. In the second year, a switch is made to problem-based education with more open defined weekly sub-assignments. Students have to form sub-questions themselves. In the next step towards the final level, project education is used from year 3 onwards: students work in groups on projects, in which they are hardly guided by sub-assignments or sub-questions. The (intermediate) products they produce are complete professional products. Students are still guided in this process by a tutor, and can submit subject-specific questions to an expert. In the final phase of the programs, during internships and graduations, the student works individually on an assignment/project in an experimental research setting. As a result, the student works on his/her integral competence development at the highest level. In addition, the internship serves a dual purpose: developing competences and orientation towards the profession. The development of the BoKS during the courses is aimed at both broadening and deepening. The panel notes that the OWE's are arranged in such a way that the whole of the intended BoKS is covered in the curriculum. Many subjects, as well as the

competences, come back at an increasingly higher level during the curriculum. Topics that are less central to the respective professional practice are only discussed once or twice.

Research skills

The 'Conducting scientific research' is the central element of the professional profile of a graduated student of Chemie and/or BML. Research competences and research skills are therefore an integral part of the competence profile and therefore of the described final qualifications. The core research competences are: 'Designing an experimental design', 'Experimenting' and 'Analyzing results'. These form a research cycle. These core competences are supplemented by domain and general hbo competences, which are complementary and supportive to the execution of the research cycle in practice. Through the competence 'Designing experimental design', students acquire research skills such as reading scientific literature, drawing up research questions and hypotheses, and creating a research plan. The competence 'experimentation' refers to the methods used to carry out the research in the laboratory. With the competence 'analyzing results', students acquire skills in analyzing data, possibly with the help of statistics, drawing conclusions with regard to the research question, and proposing follow-up research. During the program, students work on research assignments, with which they develop the relevant competences. Increasingly, companies and project leaders of the HAN and Universities abroad are involved with their research in the educational units. Because the field of work of the graduates is active in both fundamental (e.g. universities) and applied (e.g. hospitals and companies) research, and the study programs also want to prepare students for a follow-up in university and professional master's programs, it has been decided to become proficient in the execution of research with both a fundamental and an applied character. It should be kept in mind that the research skills for basic and applied research are largely the same and also that there is not always a sharp distinction between fundamental and applied research.

Lectorates

The panel believes that the Drug Discovery and Biobased Innovations Lectorates, affiliated with the HAN BioCentre, are well involved in Chemie and BML. Moreover, there is a good interaction between the educational programs and the Lectorates, according to the panel. Lecturers and lecturer-researchers participate in various Lectorates. Lectorates offer a place to do research and graduate. In addition, Lectors are involved in (designing) education. The Lectorates are such an integral part of the HAN BioCentre that students did not (re)know the term "Lecturers" and "Lectorates" as such, while they knew the HAN BioCentre well. The panel therefore advises the programs to name the Lectorates and Lectors as such more often to the students in order to bring them to the attention of the students more often.

Internationalisation

Chemie and BML graduates often end up in research groups at universities, companies or hospitals that are characterized by international research teams or international collaborations. It is therefore important that this international character of professional practice has a clear place in the educational programs of Chemie and BML so that students are well prepared for professional practice and are sufficiently equipped to work in the international field. The program of BML including the English-language variant was assessed as 'sufficient' in the pilot 'Bijzonder Kenmerk internationalisering' (2010) and the level of the graduates as 'above average'. In 2013, the internationalisation project started with the aim of tightening, improving and expanding SABC's internationalisation objectives. In two separate reports, the findings, conclusions and opinions of

the panel with regard to the assessment of both programs for the Special Cequint Feature on Internationalisation are described. Based on the programs, assessment and final works, the panel finds that the Chemie and BML programs do prepare students for the internationally oriented field of work.

Design of the program

Didactic concept

In their vision on learning, Chemie and BML start from the following key points: integrating knowledge and skills in practice-relevant situations/application contexts promotes learning (practice-based learning). It connects to the initial situation of the student and builds on existing knowledge and skills (constructivist learning theory). Students learn from each other (interactive learning). It benefits the learning outcomes if students have an active productive attitude (active learning) and if students think about their personal development in relation to the profession (reflective learning). Therefore students have to formulate their learning questions independently and/or in interaction with others, and they are challenged to actively look for answers (question management). This goes hand in hand with increasing self-efficacy and personal responsibility in the learning process (independent learning). Education is shaped by the blended learning principle: the proper connection of various activating learning activities (online and physical). The panel finds this vision on learning clearly recognizable in the program, the assessments and in the student's guidance.

Chemie and BML believe that their vision on learning is best expressed in a competency-based training model. Practice-oriented learning is realized by working on professional tasks. To perform a professional task, students apply integrated knowledge, skills, and attitudes (collectively called competences). During the program, realistic and varied case studies from professional practice are used to enable students to develop all the necessary competences in the broad context of practice. Students work actively and partly in (international) groups on assignments from professional practice. The working methods used require an active attitude from the student. As the program progresses, more and more independency is required of the student when carrying out the assignments and the complexity of the assignments increases. By gradually increasing this independency and complexity, constructivist learning theory is met.

Inflow and learning routes

The panel appreciates the efforts Chemie and BML have made to arrange a high-quality intake and learning-paths. Chemie and BML offer students a number of possible learning routes and options in the minor. Chemie and BML start with a common first semester (30 credits) after which the students continue in the second semester (30 credits) in the BML or Chemie direction. The choice of direction has already been made when registering for the program. In the second year, the students in the Chemie and BML continue towards the program of their choice.

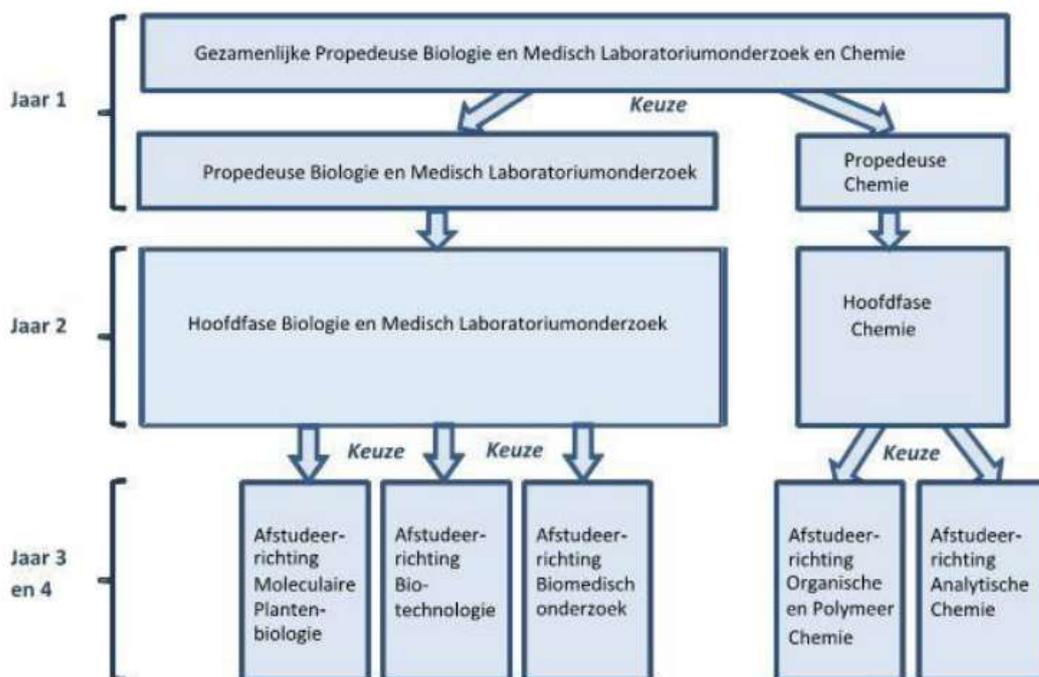


Figure 2: Diagram of the structure (in Dutch) of the Chemie and BML programs and the specialization options.

After the second year, BML students can choose the specializations Biomedical Research (two contexts: carcinogenesis and neurobiology), Molecular Plant Biotechnology and Biotechnology. The students of the Chemie program can choose the specializations Organic and Polymer Chemistry or Analytical Chemistry.

In addition to the choice of study and graduation directions, the student has options with regard to internship, graduation and the minor. The minor can be broadening and deepening. SABO offers the following minors: Molecular Plant biology, Biorefinery, Bio Nanotechnology, Drug discovery, Bioinformatics and a Research minor at a company. Furthermore, students can choose from “free” minors (Dutch: Vrije keuze Minoren), such as transfer programs at the university in preparation for further academic education and research minors. They can also choose from other minors included in the HAN minor guide. It is a conscious choice to offer students ample free choice (1/4 to 1/3 of the study program) to fill part of the curriculum with elements from outside the Chemie or BML program. This strengthens the vocational orientation and the preparation of students for the professional practice. Because of this, and because of the vocationally oriented in-school curriculum, the preparation for the professions-practice is strengthened. The student's choices are recorded by means of study contracts and have to be approved by the exam committee.

There are different learning routes, based on the different previous educations. The standard four-year trajectory is for the intake with havo diploma (N&G or N&T) or an unrelated MBO education level 4. The English-language BML and Chemie programs are also four-year in duration. There are similar admission requirements and a language requirement for sufficiency in English.

A continuous point of attention is to improve the connection to the secondary education. For example, in 2020-2021, the first semester was revised to achieve a soft landing for students. A

three-year trajectory is possible for the intake with an MLO diploma or VWO diploma (N&G or N&T), whereby students start in the second year of study. For MLO'ers, this is (in principle) the standard route. However, students who are eligible for a three-year trajectory do not receive an exemption for the propaedeutic year. With the exception of a number of compulsory first-year courses, they can demonstrate that they meet level 1 if they obtain a OWE at level 2 and thus master the corresponding competences at level 2. The few students who cannot directly cope with level 2 can still easily switch to the 1st year and follow the education at level 1 there.

With the MLO degree programs of ROC Rijn & IJssel and ROC de Leygraaf, a transfer program has been drawn up. The MLO students who participate in this, in the last semester of their MLO program, follow the education of the second semester of our propaedeutic year including mathematics and lab arithmetic. In this way they can get used to the HAN education system and assess before intake whether they can handle the bachelor level.

Outside the Netherlands, the programs also have cooperation links. For example, there is a dual-degree program with Hochschule Bonn-Rhein-Sieg and a joint-degree program is being developed with University of Dundee. The part-time Chemistry program is aimed at retraining students: students with an MLO prior education who want to get a higher level in their subject. Nominally, the part-time program lasts six years, but the part-time student has the option of shortening this by requesting exemptions for the minor and internship on the basis of work experience. The panel is positive about the attention that the programs have for students from MBO who are moving on and that they have concretized this through various learning routes.

Coaching

Students are guided in learning professional knowledge and subject-specific skills, making study choices, learning study skills, getting to know the organization, reflecting on themselves and the study program, and possibly solving financial or personal problems that affect the study. Guidance takes place by study career counselors (SLB'ers), tutors, experts, subject lecturers, the internship supervisor, the graduation supervisor and possibly by a study supervisor or a dean.

Study career guidance (SLB). The programs want to match as much as possible the differences between students in terms of prior education, interest in the various disciplines and preferred learning style. SLB focuses on support in getting to know the organization and in making study choices, guiding students in reflecting on themselves and the study program, developing study skills and possibly guidance in finding a solution to financial or personal problems. The goal of SLB is to achieve the highest possible student satisfaction and study efficiency. Each student is assigned a study career counselor (SLB) twice, in the propaedeutic phase and in the main phase. In the propaedeutic year, SLB is linked to the educational group of which the student is a part. This educational group consists of a maximum of 16 students who also follow all other courses together. During the first two blocks of the propaedeutic year, one SLB lesson hour is scheduled every week and in the last two blocks this is still three separate lessons per block. During these classes, the emphasis is on developing study skills and choosing the right specialization?. In addition to the SLB lessons, there are also three individual conversations with the SLB'er in which the study progress is reflected on. SLB in the main phase is focused on making choices and planning regarding the specialization, minor, internship and graduation position. In the second year, a number of lessons are given specifically focused on these topics. Twice a year, an individual conversation takes place between the student and the SLB. If needed or wanted, a

student can request more individual conversations. Students are satisfied with the good, personal guidance by SLB members and senior SLB staff (see below). The panel concludes that both Chemie and BML professionally and carefully execute SLB.

Tutors. A tutor guides an educational group of up to 16 students. Focus is on starting, executing and evaluating assignments. There are one to three tutor classes per week. The purpose of these tutor lessons is to independently start up, perform and evaluate teaching tasks. The tutor classes take place in the form of a meeting in which one of the students is president, one of the students is a note-taker and the rest of the students actively participate in the meeting. The tutor monitors the level of content of the task and the process. At the end of the block, each student is assessed for collaboration by their fellow students and by the tutor.

Professional guidance. The role of subject-specific guidance lies with the experts and subject lecturers. Experts are lecturers who offer students substantive support in the execution of the central assignment. Students can contact the expert at scheduled times, who can then provide additional explanations or answer questions. Subject lecturers give one or more hours of lectures, tutorials and/or practical lessons on specific subject matter that is linked to the subject of the OWE. Regular contact also takes place between students and lecturers outside of class hours.

Internship and graduation supervision. At the internship and graduation place, a student is supervised by a field supervisor. The task of the field supervisor is to introduce the student to the company, to guide him in carrying out the assignments and to advise the program on the assessment. From the program, the student is supervised by an internship teacher. This teacher monitors the level of the project work, the functioning of the student and the supervision by the field supervisor, and is the point of contact for student and field supervisor.

Senior tutor (senior SLB'er) and student counsellor. For arranging all kinds of practical matters such as scholarship, reimbursement of tuition fees in connection with special circumstances, discussion of (the study consequences of) serious physical and psychological problems, students can be referred by the SLB employee to the senior SLB member or the student dean. The panel appreciates this type of professional coaching on top of the other forementioned ways Chemie and BML support their students.

Staff

The education of Chemie and BML is provided by Result-responsible Teams (RvT's) consisting of practical lecturers and lecturers. Support at the laboratoria takes place by teams of TOA's (Technical Teaching Assistants). Students are very enthusiastic about the substantive expertise of lecturers, the knowledge they have about professional practice and the creation of a safe environment in which students feel free to ask questions. The panel finds that the teams are a good mix of work experience in the lab and/or as a teacher in secondary education. Together with the latter group of colleagues, Chemie and BML also contribute to a good transition from secondary school to bachelor's programs.

The level of education of the lecturers is high: the vast majority have a master's degree or have a PhD and have extensive experience in the professional field. A number of lecturers are partly employed in the professional field. In addition, a significant proportion of the lecturers have studied and/or worked abroad and/or are of foreign origin. Because of these different expertises

within the education teams, all parts of the curriculum can be offered. A number of lecturers are partly working for a Lectorate as researchers. In addition, all researchers from the Lectorates are partly employed in the education of the study programs. Anyone who teaches as a teacher in the English-taught BML or Chemie program has the obligation to obtain the Cambridge Certificate at C1 level. Practical lecturers are required to qualify at least at B2 level. Finally, guest lecturers are involved in the programs. They lecture on specific topics, act as experts, and/or are involved in the assessment of students' products. The responsibility for the design of education lies with internal, didactically trained lecturers. A number of these lecturers work for part of their appointment at the Lectorate Biobased Innovations or externally.

Almost all lecturers and practical lecturers have obtained the BKE (Basic Examination Qualification). There is also a group of lecturers who have obtained the SKE (Senior Examination Qualification), including various members of the examination committee. Part of this group of lecturers has formed the test policy group. Time for professionalization is included in the annual task of the staff. In the first years of the appointment, a lot of attention is paid to didactical training in the form of a coach/mentor within the institute, and by the HAN course 'Basic Didactic Competence' (BDB). This training includes BKE certification and covers 30 weeks.

Academy-wide study days are organized. In recent years, a lot of attention has been paid to the assessments, including the given feedback. The large growth in the intake in recent years has led to some concerns among the degree programs. A concern is the size of the RvTs. Chemie and BML hope that the introduction of RvTs will ensure that the small-scale organization can promote the visibility of colleagues within the teams. Moreover, most new colleagues have little or no teaching experience and have to learn how to be a teacher in practice. All new colleagues are linked to a coaching more experienced colleague who guides them in becoming lecturers. Because many new colleagues started in recent years, this put a lot of pressure on the current lecturers. This was caused by the growing demand for didactical training and the growing number of new lecturers who still have to do the didactical training. Moreover, last year no teacher did the didactic training because of corona. The above may partly explain that students at the most recent NSE are moderately satisfied with the didactical skills of the lecturers (56% are satisfied or very satisfied with BML and 60% with Chemie). Students told the panel that new lecturers especially have difficulty with English proficiency. For example, there were Dutch terms in English-language PowerPoint presentations. But students also note that this has improved greatly in the current school year. Students especially think that the lecturers should align more regarding their vision on teaching and assessment and that their mutual communication could sometimes be improved.

The panel recommends Chemie and BML to ensure that new lecturers and more experienced lecturers are better aligned with each other about their didactic vision and way of teaching and assessing tests and final works. Students are very enthusiastic about the substantive expertise of the lecturers. They greatly appreciate the practical lessons and the link between theory and practice that lecturers address. Furthermore, students find the lecturers easily accessible, interested and their guidance-style very personal and warm.

Facilities

The SABC building has a large number of classrooms equipped with modern audiovisual equipment and other didactical tools. The facilities are shared with the other bachelor programs and the master program and research groups of the HAN BioCentre. The expansions of the building in 2019-2020 take into account the forms of education and the provision of the necessary classrooms and their layout. The panel has seen that Chemie and BML use a number of modern, well equipped, up-to-date laboratories. These are used to conduct research and education in the fields of: molecular biology, biochemistry, cell biology, bioprocess technology, microbiology, cytology, histology, organic chemistry, analytical chemistry and polymer chemistry. According to the panel, the equipment of these laboratories is 'state of the art' and representative of professional practice, partly due to the research activities of the Bio Based Innovations and Drug Discovery research groups of the HAN BioCentre. In the summer of 2021, a renovation was completed, creating more lab and teaching space. For students, more opportunities have been created to consult, work and take breaks in the building. The courses make grateful use of their own building but also run into the limits in terms of occupancy and scheduling of all educational groups. Because the programs have a hybrid learning environment at Pivot Park (Oss) and soon at Kleefse Waard in Arnhem (IPKW), teaching and research activities can also take place externally. For example, the Drug Discovery Lectorate conducts an important part of its research in Oss and provides the minor Drug Discovery there. At IPKW, all kinds of activities related to the energy transition are bundled and there the Biobased Innovations Lectorate, together with other Lectorates of the HAN, provides the minor Biobased Innovations. SABC has an equipment committee that advises on the replacement and replenishment of equipment. In the field of investments, we work together with the HAN Biocentre. The recent acquisition of maXis is a typical example of this collaboration.

Flex part-time Chemie update

The intake in the part-time Chemie program is slowly increasing every year by modest numbers. The part-time program consists of three modules: modules A, B and C. In the part-time program, education is not offered in OWE's but in units of learning outcomes (EVLs) bundled in modules of 30 EC. Modules can be followed by both students and cursists (students who only want to follow a part of the program). For each module obtained, they receive a certificate.

The part-time program is identical in content to the full-time program. Each module consists of two OWE's as applied in the full-time program. There is also a basic course that must be completed to enroll in module A. Assessment takes place via an assessment of units of learning outcomes. Assignments and teaching methods are, if applicable, adapted to the part-time form.

In contrast to the full-time program, the activities in the 30 ECTS modules are spread over one year, which means that an average study load of 20 hours per week applies. Students experience this as difficult in addition to a job, but do-able. The program lasts six years in its full scope, with the first three years being an in-school curriculum and the last three years reserved for the minor, internship and graduation. At the request of the part-time student, the minor, internship and graduation may also be completed at an accelerated pace, so that the total study time can be shortened. Following the discussion with students, the panel advises to pay extra attention to the supervision of this group of specific part-time students. Especially the provision of information, guidance and group formation were mentioned as areas for improvement. The panel endorses the opinion of the previous panel and believes that the part-time Chemie program **meets** the basic quality for this standard.

The previous panel advised Chemie in particular to further develop the didactic vision within their flexible education, so that more challenging and creative (online and offline) working methods could be developed. Lecturers could be supported even more by training in the field of blended learning. In corona time, the program started a working group on digitalization, which has invested heavily in new working methods and training in the field of online didactics. This fits with the vision on blended learning. The instructional videos are still largely used. The program started with a HAN-wide project: HAN Open Digital Horizons (HODH). The aim of this project is to increase the digital skills of the students, to make more use of digital techniques in education and to make students more data-proficient. The panel encourages the program to continue on this path and endorses the intended steps.

The previous panel thought that there should be more uniformity in the use of concepts. Old and new concepts were mixed up in documentation and in conversations, which caused confusion. There is a need for more clarity. The concepts in the documents are now more uniform in description. For example, the assessment forms have been adapted (learning outcome and EVL is now used consistently). In thought and language, however, the concepts from the full-time often remain predominant.

The previous panel advised to continue working on the standardization of the 'tailor-made' routes. It was also recommended to record experiences and use the persona descriptions to arrive at clear decision frameworks for future issues in terms of intake, intake, study routes and exemptions. The Chemistry program finds that there is so much diversity among entrants that it is impossible to always capture them in a specific persona. That is why there still is customization, where the SLB'er looks at what a student brings in regarding knowledge and skills and what a student needs in further education and development. This is recorded in teaching-learning agreements and then the student is in the lead of his/her own education.

The previous panel advised to do more work on documenting the teaching-learning agreements, so that it becomes more traceable, transparent which agreements have been made between the program and the student. This is now documented in the HAN-wide app OOK (education agreement).

The previous panel advised to see if the professional field can be given a more prominent role in workplace learning, also in the first phases. Real-life issues of the professional field are now introduced from the first module, which means that the professional field has a more prominent role from the start.

The previous panel advised the program to also record the informal quality of education in formal agreements so that it becomes more transparent for internal and external stakeholders. Think, among other things, of simple, insightful processes and equalization of terminology. The terminology (learning outcomes and EVLs) are included in all assessment forms. Through the OOK app of the HAN, specific agreements and regard of the education to be followed can be recorded in the education agreement. There is insight into what is going on in the professional field during the program through (often informal) contact between the lecturer/student and the field supervisors. In order to strengthen the interaction with the professional field, the panel advises to collect this information more formally from employers and to take the step towards the exchange of insights on broad professional themes, such as sustainability or on broad technical

innovations For the realization of the Academy Plan 2020-2022, the parttime Chemie program discussed with the AAR about important themes and innovations in the professional field. As a result of corona, contact with the professional field has been mostly digital. With the input of real-life issues from the start of the program, the interaction with the professional field has already strengthened.

Standard 3 Assessment

The program has an adequate system of assessment.

Conclusion

The Chemie and BML programs **meet** the basic quality for this standard.

The panel concludes that the described test policy is sufficiently clear and is in line with the HAN-wide assessment policy. The testing system fits in well with this and is based on the test policy. The panel also believes that the assessment is of the desired (final) level. The panel finds that the requirements described by the program for students are sufficiently clear.

The panel concludes the assessment of the tests and end works, that the panel has viewed, is sufficient and agrees with the intended bachelor level. In consistently formulating feedback in the assessment of final works, the panel still sees room for improvement, see: Recommendations. The panel advises the programs to make sound recordings of the assessment interviews and to archive them. Students still see opportunities for improvement with regard to testing, such as the coordination of assessors about the method of assessment. The panel considers the assurance of testing to be sufficient, and it compliments Chemie and BML on the range of group of actors involved.

Substantiation

Assessment Policy

The assessment policy plan is aligned with the principles of the HAN's institutional plan. The programs have described their vision on tests in SABC's test policy plan. The study programs believe that the starting point of assessment is to support the development of the student during his studies. The student must direct his own development and testing must be a means for the student to have insight into his progress with the end goal in mind. As a result, the student develops an active learning attitude and is intrinsically motivated to work on his studies. The starting point is also that the student can show that he has mastered and can apply a competence / skill / knowledge. A transparent system of tests that contributes positively to this, consists of giving feedback and objectively assessing realized level and final qualifications. Flexibility and diversity of test forms is a prerequisite for motivating the student and being able to objectively assess the student's progress.

The programs investigate the introduction of programmatic tests, because they think this fits well with the testing of skills. Testing knowledge is most effective in written tests with open or closed questions. The aforementioned view on testing must be reflected in the system of assessment. This means that testing will follow more individual trajectories, with which testing will have a more formative nature, testform and testtimes will become more flexible, and a feedback culture is set in place. The test will have a visible relationship with the final goal and the development of the student the entire course is followed by means of a study career (SLB) program.

The panel finds that the assessment criteria are derived from the described (final) qualifications (competences in the context of the BoKS) at the respective level. The panel has seen that the whole of the tests and the underlying levels cover all final qualifications. The panel finds that the relationship between final qualifications and testing is recognizably in the program. Moreover, the

assessment of an OWE is related to the education that was carried out in these. Both education and testing are an integral application of a (large) number of competence indicators and BoKS, see: figure 3. The panel is positive about this.

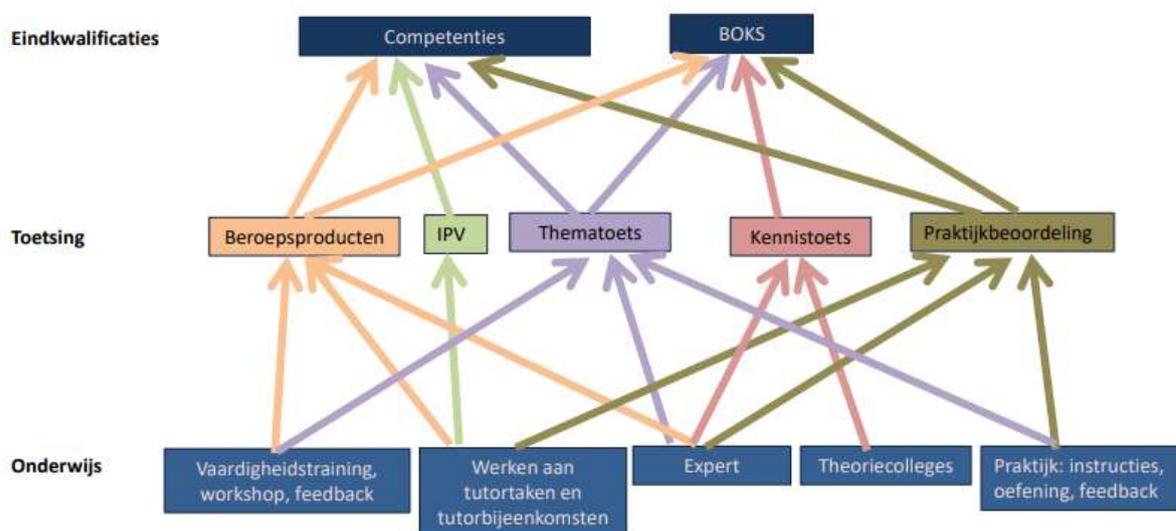


Figure 3: Schematic overview of the relationship between education, assessment and the final qualification in a representative in-school education unit

Execution of assessment policy

Testing instruments, insightful assessment, feedback

The panel concludes that the assessment of qualifications fits well with the education system of Chemie and BML. Students are tested for their qualifications in the professional context during the program. This leads to a test that consists of knowledge tests in the in-school curriculum, in which the BoKS of the relevant module is tested. In addition, there are thematic tests, in which the application of knowledge and the (theoretical) skills in the context of the theme are tested. In the professional products, such as research plans or reports, professional competences are tested in the context of the theme. In practice, practical skills are assessed. Finally, there are general (Interpersonal) hbo competence assessments, through which a number of generic hbo competences are assessed. The panel believes that the chosen test forms are appropriate to test the relevant components.

During the internship and the graduation project, the assessment takes place on the basis of the student's performance in professional practice. As a result, the final level achieved in the graduation assessment can be tested integrally by means of assessment criteria derived from the final qualifications. In accordance with the HAN-wide testing framework, the achievement of the competences at levels 1, 2 and 3 is integrally tested at Chemie and BML. Integral assessment at levels 1 and 2 therefore goes hand in hand with achieving the learning objectives of a number of OWE's at the relevant levels. With the graduation project, all competences are integrally tested at level 3. The panel finds this positive.

Students indicate that they are well informed about how they will be tested and assessed. This is always discussed in class before the test. In the course description and study planner, this

information is sometimes not clear enough, according to students. The panel advises the programs to describe this clearly in the course description and the study planner. According to students, test questions are sometimes not clearly formulated. During the debriefing, they can indicate this and this will be discussed. If they do not agree with their grade, they can put this in a formal objection with the assessment committee. This sometimes results in adjustment of the standards for the entire group or all tests are reassessed. Finally, students indicate that the practice tests are not always representative of the real test. The panel advises to investigate this signal from students. The feedback given by lecturers is perceived as clear by the students, but in some cases could be more extensive. The panel has seen in some tests that the feedback from the assessor and the motivation of awarding points is sometimes incomplete or missing, see: recommendations. Students can, however, receive an oral explanation if they indicate this to the relevant assessor. Students find that within the teaching team there are sometimes different views about teaching and the assessment of tests. Students also indicated that things have improved recently. The panel advises to organize calibration sessions among assessors more often, and communicate the results in the teams. The panel also recommends that assessment models (Dutch: antwoordmodel of correctievoorschrift) should always be archived, so that new lecturers with little teaching- and test experience can more easily join in.

Quality assurance

Role of the Board of Examiners and the Examination Committee

The quality of the tests is guaranteed by the quality assurance-, the curriculum-, the test-committee, the Board of Examiners and the examiners themselves. The Board of Examiners is responsible for the quality of the assessment and guarantees the quality of the graduates. The Board of Examiners has an external member, coming from an Board of Examiners from another university of applied sciences in the same domain. Among other things, this member provides feedback on the functioning of the examination committee and provides insights into the assurance mechanisms. An example of such a safeguarding mechanism that the Board of Examiners uses is that it appoints the examiners every year. A new teacher can be appointed as an examiner if the teacher has obtained the certificate Basic Qualification Examination (BKE), Basic Qualification-Didactic Competence (BDB), Basic Qualification Education (BKO) or equivalent training and has been employed for at least one year. For examiners of English-language written tests, it applies that they have at least the Cambridge certificate C1 (CAE) or master the English language at an equivalent level. Assessing professional products and practice requires a minimum command of the English language similar to the Cambridge certificate B2. The test committee (Dutch: toetscommissie) functions under the responsibility of the Board of Examiners. The main task of the assessment committee is to safeguard and improve the test quality as measured by validity, reliability and transparency. Each test is seen by a second subject teacher before it is taken. The assessment committee also examines the returns of knowledge tests and professional products after each block, including resits. As of last academic year, also an inventory has been made of which tests more often lead to requests for recorection, in order to then evaluate the test questions and answer models, in particular for clarity. Furthermore, test- and answer models are evaluated randomly or on request by the test committee and recommendations are made. It is also checked whether these correspond to the test program.

Assessment and quality assurance of the final project

The Board of Examiners guarantees the final level by appointing examiners annually on the basis of test expertise and by sampling. The programs play a role in safeguarding activities such as: study days, calibration sessions, assessing final works on the basis of the 4-eyes principle, lecturers attending graduation sessions at other universities of applied sciences and vice versa, and the use of committed parties at graduation sessions (see also: Standard 4).

The assessment of the portfolio is done by the first teacher and the assessment form for the work experience is completed by the company supervisor. The two examiners each separately complete the form for the report and for the presentation and defense. At the graduation session, the two examiners conduct the discussion about the partial and final assessment with the company supervisor and the external supervisor. In this way, the work is viewed from four sides, which gives a very real picture of the student's functioning. The panel is impressed by the presence of an independent, content expert committed at each graduation session. The panel believes that the commitment of all parties involved makes a valuable contribution to guaranteeing the quality of the final level. The responsibility for the grades awarded ultimately lies with the examiners. The final mark is the average of the three grades obtained, all of which must be sufficient. In addition, the portfolio must have been rated with a "Satisfied". All competences are tested at HAN level 3 and must be sufficient.

The panel has seen in some assessment forms of final works that the feedback varied in quality, or was partly lacking. For example, it was not always clear why only part of the points indicated in the rubric were awarded. Interviews with both students, examiners and the Board of Examiners have shown that an oral explanation of the assessment is given during the assessment interview. In addition, it is permitted to award a partial number of points within a rubric. The panel makes a recommendation about the feedback given (see: Recommendations) and advises the programs to make an audio recording of the assessment interview and to archive this recording as well. In addition, the panel recommends increasing the frequency of the sampling of the final works, in order to better monitor the quality of feedback given on the assessment forms.

Flex part-time Chemistry update

The panel endorses the opinion of the previous panel and believes that the part-time Chemistry program **meets** the basic quality for this standard.

The previous panel advised that the didactic vision of flexible education should be further extended in the assessment by offering students more room for their own choices in how they are tested, with what kind of professional product. The program now offers this option at certain places in the program, but students still often opt for the 'standard route'. With the introduction of the new testing policy, the program is developing a little more towards the desired flexibility. The panel encourages the program to further shape this development.

The previous panel advised the Board of Examiners to take a more proactive role and to pay more attention to the individuality of study routes in the part-time program. According to the panel, the part-time program needs direct representation in the curriculum and program committee. In 2022, several lecturers that teach full-time and part-time will be part of the curriculum and education committees. The panel believes that the part-time program is sufficiently represented in this way.

The previous panel recommended that the teacher team should pay attention to calibration among lecturers in terms of assessment procedures, the interpretation of assessment criteria and the more equal completion of the assessment forms. In the teaching team there is more and structural attention for the interpretation of assessment criteria and the more equal completion of the assessment forms for all modules. Such calibration sessions have now been introduced throughout the academy; in the part-time Chemie program, these sessions take place four times per academic year.

Standard 4 Achieved learning outcomes

The training shows that the intended learning outcomes have been achieved.

Conclusion

The Chemie and BML programs **meet** the basic quality for this standard.

The panel notes that the programs demonstrate that the intended learning outcomes are being achieved. The panel bases this mainly on the final works, which are certainly at hbo bachelor final level. In addition, the panel notes that the programs produce professionals who function well in the professional field. The panel compliments the degree programs on the attention to skills that graduates need when working in an international context. Finally, the panel finds that the programs have excellent connections with both the professional field and alumni, and are and remain well informed about the functioning of graduates.

Substantiation

Graduation program

For both programs (and for all variants), the design of the graduation project, the procedures surrounding graduation and the assessment forms are identical. The graduation consists of individually setting up and carrying out a research project. Usually students carry out their graduation assignment at a company or a knowledge institution such as a university, but a graduation assignment at one of the professorships is of course also possible. With the graduation project, the student demonstrates that he is able to apply the acquired knowledge, skills and attitude in practice. The assessment of the graduation assignment is based on the following components: satisfied/not met assessment of the portfolio, a grade for the work, a grade for the report and a grade for the presentation and defense during the graduation session.

For students of Chemie (English variant) and BML (English variant) it is mandatory to write the report in English, for students of the Dutch-language programs it is a choice. If the student graduates in an international environment, an English-language report is usually a requirement. Because the programs encourage an English-language report in the context of internationalisation, about 85% of the students have received an English report in the last two years of study (2019-2020 and 2020-2021). From academic year 2022-2023, an English summary is mandatory for all students, even if the rest of the report is written in Dutch. During the graduation session, the student first gives a presentation about his research, after which an extensive questioning follows. In principle, the following are present at a graduation session:

- the first lecturer (examiner): graduation supervisor and chairman during the session
- a second independent teacher (examiner)
- the company supervisor: advises the examiners on the point for the performed work
- an external supervisor (the committed party): monitors the quality of the graduation project and the assessment. The external supervisor is encouraged to provide feedback after each hearing (written or oral), but this is not mandatory. The external supervisors are also interviewed 2-yearly with an extensive evaluation form.

The external supervisors are generally positive about the level of knowledge, skills and attitude of the graduates. An important point of attention that they mention is: the language skills in the

report. The same picture emerges from an evaluation among companies from the AAR (June 2022). This also showed that the theoretical level of the graduates is good and they are practically very skilled. However, contacts from the professional field note that writing a report is difficult for many students (from HAN and also from other institutions), both in terms of language skills and in terms of structuring. In the meantime, the courses have taken various actions in this regard. For example, a writing curriculum has been implemented with the aim of improving the writing skills and reporting of students. During the internship return day, a "scientific writing" workshop is organized to help students on this topic. Finally, there is a writing coach who can be called in if the student has difficulty writing. The panel compliments the programs on the extra attention paid to the language skills of students.

Graduate products

The panel studied 15 BML theses and 15 Chemie theses, four of which were from the part-time Chemie program. The panel found the HBO bachelor final level of the studied final works sufficient to good. Moreover, the panel found the final works relevant, up-to-date and immediately deployable in the professional field. Examples of thesis projects Chemie are: "Crosslinking PEG-b-PS polymersomes; the search for new possibilities", "GPC purification method development for pak's in herbs" and "Preparation of Phytosulfokine Analogues by Solution and Solid-Phase Synthesis." Examples of BML's thesis are: "The anti-inflammatory effects of Rk1, β -Escin and DT13 on RAW-264.7 macrophages", "Detecting Group B Streptococcus using PCR on the GeneXpert" and "Improving the stability of plant protein based oral nutritional supplements through fermentation."

Functioning of graduates

The professional field is satisfied with the quality of the graduate students, as shown by a survey of companies from the AAR (June 2022) and feedback from the external supervisors (committed) companies. The professional field regularly tells Chemie and BML that they have a considerable theory component in the courses and that this is highly appreciated. Since 2015, ties with alumni have been strengthened and formalized, which has led to alumni policy and the official establishment of the alumni association HANalyst in 2018.

Alumni of Chemie and BML are capable of starting, which also appears to be the HBO monitor 2021. Alumni of both BML and Chemie have a job quickly (within a month to half a year after graduation). The surveyed graduates indicate that the program and the current position fit well together in terms of level and direction. Students themselves experience that they acquire skills that are relevant in professional practice. They are also (very) satisfied with the basis they have gained to further develop the competences, the connection between programs and their function and the programs in general.

Unfortunately, in times of corona, Chemie and BML could not organize anything for alumni and there was also (almost) no mutual contact. At the moment there is mainly informal contact with alumni and on an individual level. On the career days, alumni tell current students about the connection of their education to work in practice, and this is also done through contact with lecturers on LinkedIn. In addition, Chemie alumni in the specialization Analytical Chemistry are often clients of assignments themselves. The programs hope to breathe new life into HANalyst, partly on the basis of previously collected wishes and needs of alumni, so that people can stay in touch with the wishes and needs of alumni in a more bundled, structured and simple way. The panel noticed that both Chemie and BML are, and remain, well informed about the functioning of alumni and encourages them to reestablish their contacts on a structural basis with alumni.

Flex part-time Chemie update

The panel endorses the opinion of the previous panel and believes that the part-time Chemie program **meets** the basic quality for this standard.

The previous panel found that after having delivered the first graduation cohort, the program could first evaluate the educational program as a whole and determine whether this has led to the expected final level. In addition, an evaluation on which test forms students mainly choose might give insight in possible alternative professional products for graduation. There have not been many graduates in recent years, but the professional field is satisfied with the final level of those part-time students. Choosing test forms and alternative professional products for graduation is not currently an issue. Although the part-time Chemie program is ahead in terms of flexibilization, these are developments that need to be looked at together with the full-time and part-time programs.

The panel found the HBO bachelor final level of all the final works studied to be good. Moreover, the panel found the final works relevant, up-to-date and useful for the professional field.

Examples of thesis are: "Identification and quantification of the monomer composition from alkyd- and polyester resins through direct-NMR, microwave NMR, microwave-GC/MS and Pyrolysis-GC/MS", "Method development and validation of mycophenolic acid in human plasma" and "developing the method of determination of antioxidant in resin with rp-hplc."

Final verdict on the program

	Chemie VT	Chemie DT	BML VT
<i>Standard 1 Intended learning outcomes</i>	Meets the generic quality requirements	Meets the generic quality requirements	Meets the generic quality requirements
<i>Standard 2 Teaching-learning environment</i>	Meets the generic quality requirements	Meets the generic quality requirements	Meets the generic quality requirements
<i>Standard 3 Assessment</i>	Meets the generic quality requirements	Meets the generic quality requirements	Meets the generic quality requirements
<i>Standard 4 Achieved learning outcomes</i>	Meets the generic quality requirements	Meets the generic quality requirements	Meets the generic quality requirements

The judgments are weighted according to the decision rules of the NVAO. Based on this, the visitation panel assesses the quality of the existing hbo bachelor's programs Chemie and BML of Hogeschool Arnhem Nijmegen as **positive**. Based on the positive quality about the four standards, the panel has a **positive** final verdict for the Chemie and BML programs.

Recommendations

The panel has the following two recommendations.

Standard 3

Make sure that the (written) feedback on assessment forms of tests and final works is complete and of good quality, so that it becomes clear(er) how the assessors awarded their points.

As Board of Examiners, make sure you regularly take samples of assessed final works and communicate the findings with the two degree programs.

Appendices

Appendix 1. program for the site visit, 20 September 2022

Moment	Conversation/theme	Participants
8.45 – 9.00	Reception and preparation of the panel	Mt; academy managers Chemie and BML
09.00 – 9.45	Presentation/pitch and time for questions	<ul style="list-style-type: none"> • Academy Manager BML • Academy Manager Chemie and Bioinformatics • Academy Director • Lecturer Drug Discovery • Main phase coordinator Chemie • Main phase coordinator BML • Propaedeutic coordinator BML • Coordinator Part-time Chemie and lecturer Chemie • Coordinator Internationalization • Teacher BML / Internationalization • Lecturer Chemie / Internationalization • Lecturer Chemie / Internationalization) • Policy officer academy
9.45 – 10.00	Break + consultation	
10.00 – 11.00	Interview with students BML / Chemie / Chemie Part-time With a mix of Dutch and English variants	<ul style="list-style-type: none"> • BML cohort 2018/2019 • BML cohort 2021/2022 • BML cohort 2020/2021 • Chemie cohort 2018/2019 – former student member OC • Chemie cohort 2019/2020 • Chemie cohort 2019/2020 – student member OC • Chemie cohort 2019/2020 • Chemie part-time cohort 2020/2021
11.00 – 11.15	Break + consultation	
11.15 – 12.15	Conversation with lecturers, lecturer researchers and lecturers	<ul style="list-style-type: none"> • Lecturer BML • Lecturer BML • Practical teacher BML • Lecturer/researcher BML • Teacher BML • Lecturer Chemie • Lecturer/researcher Chemie • Lecturer Chemie • Practical teacher Chemie • Lecturer Chemie part-time and Chemie • Lecturer Drug Discovery
12.15 – 13.00	Lunch + consultation	
13.00 - 13.45	Final level discussion with alumni, HAN examiners, workplace supervisors and committed persons (= external supervisors)	<ul style="list-style-type: none"> • Internship coordinator BML • Internship coordinator Chemie • Board of Examiners SABC • Committed BML • Committed BML • Committed/workplace supervisor Chemie • Workplace supervisor Chemie • Alumnus Chemie 2018 • Alumnus BML 2019
13.45 - 14.00	Break + consultation	
14.00 - 14.30	Discussion with the quality assurance committees, Curriculum Committee, Program Committee, Examination Committee, Review Committee, Department Advisory Board	<ul style="list-style-type: none"> • Member Curriculum Committee • Member Curriculum Committee • Chairman Program committee • Member Education Committee • Chairman of the Board of Examiners • Member review committee

		<ul style="list-style-type: none"> • External member of the Chemie Advisory Board • External member advisory board BML • Member quality assurance committee
14.30 – 14.45	Break + consultation	
14.45 - 15.15	Conversation Special Feature Internationalization (in English) BML, with a mix in Dutch and English variant students	<ul style="list-style-type: none"> • Student BML cohort 2019/2020 • Student BML cohort 2020/2021 – vice-president Academy Council • Student BML cohort 2018/2019 • Lecturer Bachelor/Master and coordinator internationalisation • Lecturer BML • Lecturer BML • Lecturer BML • Lecturer BML
15.15 - 15.45	Conversation Special Feature Internationalisation (in English) Chemie	<ul style="list-style-type: none"> • Student Chemie cohort 2020/2021 • Student Chemie cohort 2020/2021 • Student Chemie cohort 2019/2020 • Lecturer Bachelor/Master and coordinator Internationalisation • Lecturer Chemie • Lecturer Chemie • Lecturer Chemie • Lecturer Chemie
15.45 – 16.00	Break + consultation	
16.00 – 16.30	Interview with MT	<ul style="list-style-type: none"> • Academy Manager BML • Academy Manager Chemie and Bioinformatics • Academy Director • Lecturer Drug Discovery
16.30 – 17.15	Review panel	
17.15 - 17.30	Feedback findings	<ul style="list-style-type: none"> • Academy Manager BML • Academy Manager Chemie and Bioinformatics • Academy Director • Lecturer Drug Discovery • Main phase coordinator Chemistry/Chemistry • Main phase coordinator BML • Propaedeutic coordinator BML • Coordinator Part-time Chemie • Coordinator Internationalization • Lecturer BML/Internationalisation • Lecturer Chemie/Internationalisation • Lecturer Chemie/Internationalisation • Policy officer academy SABC • Educationalist SABC • Member of the Executive Board of HAN

Appendix 2. Examined documents

- Organisation chart SABC with RVT's
- HBO Monitor 2021
- Recommendations for visitations and audit
- BSc-Applied-Science profile description 2020
- OS-OER BML 2021-2022
- Program Statute and Education and Examination Regulations Bachelor's Program biology and medical laboratory research 21-22
- OER H9 OWE's BML 2021-2022
- DS-EEA Life Sciences 2021-2022
- Degree Statute and Education and Examination Regulations of the Bachelors degree course Life Sciences 21-22
- OER H9 OWE's BML 2021-2022
- Comparison tables BML and LS (English variant of BML) 2021-2022
- OS-OER Chemie VT 2021-2022 (after erratum June 22)
- Program Statute and Education and Examination Regulations Bachelor's Program chemistry 21-22
- OER H9 OWE's Chemie 2021-2022 (na erratum)
- DS-EEA Chemistry 2021-2022
- Degree Statute and Education and Examination Regulations of the Bachelors degree course Chemistry 21-22
- OER H9 OWE's Chemistry 2021-2022
- Comparison tables Chemistry 2021-2022
- Program Statute and Education and Examination Regulations Bachelor's Program chemistry 21-22
- EVL-DT-Chemistry-BKCH-2021-2022.
- EVL-DT-Chemistry-Main phase-2021-2022.
- Competency profile Biology Medical Chemistry 2019-2020.pdf
- Competence training and testing in courses: situation 2009
- Applied Science Training Plan 2022
- Personnel Overview
- Bet list 2022-2023
- Annual task IAS 2012 - 2013
- Test policy plan ITBC adjustments Oct 2020.
- Annual report Board of Examiners SABC 2020-2021
- On-site inspection of various tests including assessments, reports, various educational material (manuals, etc.)

Selection of the studied thesis (final projects)

Thesis #	Chemie	Chemie part-time flex	BML
1	X		
2	X		
3	X		
4	X		
5	X		
6	X		
7	X		
8	X		
9	X		
10	X		
11	X		
12		X	
13		X	
14		X	
15		X	
16			X
17			X
18			X
19			X
20			X
21			X
22			X
23			X
24			X
25			X
26			X
27			X
28			X
29			X
30			X