



Recommendations of the Seminar "Chemistry Studies in the European Higher Education Area", Dresden/Germany, June 14-15, 2004

FINAL

First Cycle

- When designing first cycle study programmes, institutions should try to make use of the widely-accepted European Chemistry Thematic Network (ECTN) Chemistry Eurobachelor framework as far as possible in order to increase the transparency and compatibility of their first cycle qualifications and to help recognition. If they decide to adopt this framework, they can document the international character of their qualification by applying for the "Eurobachelor Label" to be offered by the ECTN Association.
- Institutions should do all in their power to improve students' employability. Experience in the UK and Ireland shows that Bachelor chemists are employable, not only in chemical and chemistry-related disciplines but in many others. This is due not to the depth of their subject knowledge but because of the skills and competences they acquire during their education. It is important to document these in order to show that employability does not require the use of specialised modules offered by non-chemists.
- Quality and transparency will play significant roles in employability of students, more so than harmonized degree courses. However, the standards of the Chemistry Eurobachelor and the transparency of the Diploma Supplement will be helpful tools for small and medium enterprises or higher education institutions to check the quality and standards of applicants.
- The structures of first-cycle study programmes must not hinder mobility.
- Bachelor theses (or corresponding project work) should carry not less than 15 ECTS credits.
- In some cases a "practical" thesis (e.g. in a partner SME) as the final element in BSc studies at higher education institutions other than traditional universities may enhance the employability of the student.
- Training placements in industry shorter than 6 months have only a limited value.

Second Cycle

- 120 ECTS credits should be the reference point for Master programmes.
- The Master thesis should carry at least 30 ECTS credits and the research work should be organized over a defined period of time in order not to hamper student mobility.

- At the second-cycle stage institutions will in future have to compete on both a national and international basis for the best students. Thus they will need to design attractive study programmes which reflect their individual structures.
- The definition of a "Euromaster profile" analogous to the Eurobachelor will not be possible, because of the greater degree of specialisation of the former. However, the joint degree framework envisaged by the ERASMUS MUNDUS programme can act as a model for the development of genuinely "European" qualifications in chemistry.
- Access criteria for second-cycle programmes must be flexible and carefully-devised in order to make the programmes attractive. The right of access envisaged by the Lisbon Recognition Convention must be respected. No quota systems should be imposed, as these affect the rights of the individual as well as of the institution.
- Flexibility based on the bachelor diploma supplement should be introduced to handle specific situations (change of orientation, non-European students, excellent students)
- High-quality students must be afforded the possibility of transferring to a doctoral programme without formal completion of the Master degree, as stated in the recommendations of the Helsinki "Bologna series" Master conference.
- It is broadly accepted that a second cycle qualification will take a total of around five years of study to obtain, although the precise duration will depend on the learning outcomes to be achieved. Where the study pattern is, for example, 4+1 as opposed to 3+2 years, admission to a one-year second cycle course could at present involve a requirement for extra study or experience from a 3-year first cycle graduate, e.g. industrial experience.
- Master courses should be taught in English on request wherever possible.

Third Cycle

- Structured degree programmes which include coursework (in the widest sense of the term) should become a common feature of European PhD studies; however, research must still be the major element of such programmes. Part-time PhD studies should remain possible in institutions where it has been a normal feature.
- The average European PhD should spend 3 to 4 years on his or her studies. The research element of the PhD study programme should not be awarded ECTS credits.
- ECTS credits should be used to quantify the coursework component. These credits can however be ungraded, as the correct use of the (relative) ECTS grading scale will not be possible. A wide range of ECTS credits (anywhere between 20 and 60) can be envisaged. Use of the national grading scale is of course possible.
- Apart from research and coursework, further important elements of the PhD programme are teaching (as teaching assistants) and the training of key generic skills, such as those listed in the Appendix of the Chemistry Eurobachelor document.
- Institutions should issue transcripts containing information on all the coursework carried out, and on work done as a teaching assistant. Such transcripts will probably not use the standard European Diploma Supplement format.
- Institutions are encouraged to develop "Graduate School" structures at departmental, interdepartmental or regional level in order to increase their national and international visibility, to increase their research potential and to foster cooperation both between
- staff and between students.
- National structures for setting up research networks should be extended in order to internationalise such networks. PhD students should spend part of their research time at other institutions, preferably in foreign countries.

- In appropriate circumstances, suitably qualified candidates from foreign institutions should be able to go directly to PhD studies without first completing a Master programme.
- In PhD examinations, institutions should consider the widespread involvement of external examiners. Examinations should be open. There appears to be no advantage in grading the PhD.

General

- Institutions should take regard of the conclusions of Phases 1 and 2 of the project "Tuning Educational Structures in Europe".
- They should take great care that ECTS is implemented correctly, in particular with respect to workload.
- In the description of the individual course units, the objective of the course (expected learning outcomes and competences to be acquired), seems to be a problem in many institutions. As undergraduate courses (modules) in chemistry may be quite similar, it should be feasible and quite helpful to have examples of good practice available on the Internet.
- Institutions should develop formal procedures to measure and monitor student workload. Such procedures must involve feedback from the students, for example via evaluation of questionnaires related to each individual module or course unit. These questionnaires must be carefully designed so as to cover the whole range of learning activities, including examination preparation.
- There is a need for examples of good practice for course experience questionnaires and for student workload questionnaires. Perhaps the two should be combined. Experience indicates that students prefer web-based questionnaires.
- The development of interdisciplinary modules should be stimulated, particularly at more advanced levels.
- Multimedia tools which can act as important aids to teaching and learning are being developed in many countries. Since their development involves investment of much time and money, care should be taken to devise them in such a way that they are suitable for use outside the national context, i.e. to provide a European dimension to development work. The establishment of a "Bologna-wide" clearing house with download and testing facilities should be explored. Calls for appropriate EU programs are highly recommended to create synergies from existing national activities, thus amortizing invested national money
- There can be no learning without testing in higher education. New software developments and activities, also e-assessment should be considered within the frame of the Bologna process. E-Tests supply additional possibilities for checking the knowledge of students. The full scope of questioning techniques and e-testing technology should be used
- Both the programming and the maintenance aspects of multimedia tools are vital – thus there is a need for staff with chemistry *and* IT knowledge.
- The EChemTest developed by the European Chemistry Thematic Network is an example of an Internet-based assessment tool. This test will be made available in a multilingual format. Institutions are urged to participate in its further development, for example by submitting questions based on their own teaching, and to make it available for their students as a self-assessment tool.

- The German project "Vernetztes Studium – Chemie" (www.vs-c.de) provides much useful material for bachelor-level e-teaching; this material should be made available on a Europe-wide basis to interested institutions (perhaps in cooperation with ECTN).
- For all e-learning/e-teaching activities the integration of the available tools into courses, curricula, and indeed into “everyday university life” is crucial for sustainability!
- Chemists across the European Higher Education Area should support the scheme of European Chemist professional designation (details of which can be found under <http://www.chemsoc.org/networks/enc/ecrb.htm>) and the revision of the qualification tables to take account of the Bologna process. Collaboration between the Federation of European Chemical Societies FECS and ECTN is highly recommended in this matter.

These recommendations derived from the seminar workshops. They were finalised by the International Scientific Committee.

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