Integrating ECTS Credits and Diploma Supplement in Chemistry Third Cycle Studies

Document for Policy Makers
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Third Cycle Studies

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Integrating ECTS Credits and Diploma Supplement in Chemistry Third Cycle Studies

The Bologna Process was introduced with the scope of strengthening the competitiveness and attractiveness of European higher education, while fostering student mobility and employability through transparency and recognition of qualifications. In this context, the three-cycle system has been implemented, and a series of tools based on the concept of learning outcomes has been developed. These encompass qualifications frameworks, transfer and accumulation of credits, and the methodical description of all competences acquired during studies. The policy decisions taken during the ministerial conferences led in March 2010 to the establishment of a European Higher Education Area, in which now forty-seven countries participate.

Moreover, a key consequence of the Bologna Process ministerial summits has been the increasing tendency towards placing third cycle studies – the actual link between the European Higher Education Area and the European Research Area – under institutional responsibility through structured programmes. Being both students and early-stage scientists, doctoral candidates perform individualised original research, which is deeply dependent on their relationship with the supervisor. Complementing this fundamental aspect, the overall reform in third cycle education introduces training in transferable skills, stimulates mobility, fosters inter-disciplinarity, and establishes a consistent quality assurance policy based on reliable indicators.

In this frame, and in order to be fully aligned with the overarching Framework of Qualifications for the European Higher Education Area, third cycle degree programmes need to be structured and transparent, while avoiding overregulation. Academic institutions are urged to ensure that their programmes endorse the above-mentioned innovative patterns; while facing the needs of the employment market, notwithstanding that industry has not yet developed sufficient absorption capacity to harness the potential of university-based research.
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Training through research builds a mind-setting appropriate for many sectors and careers. Nevertheless, more systematic initiatives also play a significant role in shaping the profile of doctoral candidates. Third cycle taught courses\(^1\) are crucial for the individual professional development of doctoral candidates. Although a credit system is not always used, and assessment procedures are not often the case, these curricula ensure transparency and enhance mobility.

According to the national reports on Bologna Process implementation and to the relevant national legal regulations, twenty-four countries in the European Higher Education Area operate with a hybrid structured/supervision-based scheme, and only thirteen have adopted a clearly structured setting. The taught component is awarded ECTS credits in thirty educational systems, while the totality of doctoral studies is fully expressed in credits in nine out of them, five more announcing a generalised use of ECTS credits without further law-bidden specifications. In one instance supervision-based doctoral studies are allocated ECTS credits, and in another a structured scheme is not applying any credit system. In parallel, the Diploma Supplement is regularly issued in thirty countries.

Although actual implementation might so far not always keep on with official legislation, the categorisation clearly reveals that most Bologna Process signatory countries are moving towards the introduction of the Credit Transfer and Accumulation System in the third cycle. With the number of systematised third cycle studies steadily increasing, it is urgent that both the research component and the additional taught elements are understood, compared and visualised within mobility schemes, and towards the labour market. The ‘Bologna tools’ necessary to this goal have to be carefully adapted, since doctoral studies are a predominantly research-oriented degree. Hence, while ‘measuring’ them, the notion of workload and learning outcomes becomes more complex and multi-facetted.

The introduction of adequate reliable ‘Bologna tools’ in the third cycle is further reinforcing the contribution of higher education to the process of innovation by creating a frame permitting universities, eager to exchange systematically knowledge and skills for the benefit and through the mobility of early-stage researchers, to have full intelligibility in methodology and tools.

Doctoral studies in chemistry or pertinent interface topics have already been the subject of a detailed approach. The Budapest Descriptor for the third cycle (2005), an adaptation of the relevant Dublin Descriptor setting the fundamental requisites of the qualification, reads as follows:

Third cycle degrees in chemistry are awarded to students who:

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\(^1\) ‘Taught courses’ is a generic term, which may include several types of organised initiatives, e.g. frontal lectures and intensive workshops on core research skills and/or key competences, encompassing a type of assessment; as well as activities performed by the student, such as seminars held in front of an informed audience or tutoring sessions, further the authoring of publications on proper research results.
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- Have demonstrated a systematic understanding of an aspect of the science of chemistry and mastery of those skills and methods of research associated with the topic of this research;
- Have demonstrated the ability to conceive, design, implement and develop a substantial process of research in chemical sciences with rigour and integrity;
- Have made a contribution through original research that extends the frontier of knowledge in chemical sciences by developing a substantial body of work, some of which merits national or international refereed publication;
- Have competences which fit them for employment as professional chemists in senior positions in chemical and related industries, or for a progression to a career in academic research.

Such graduates:
- Are capable of critical analysis, evaluation and synthesis of new and complex ideas;
- Can communicate with their peers, the larger scholarly community and with society in general about their areas of expertise;
- Can be expected to be able to promote, within both academic and professional contexts, scientific and technological advancement in a knowledge based society.

In order to address career environments in chemical sciences, doctoral candidates should develop core research skills, which could be systematised as follows:
- Acquaintance with the methodology of research.
- Acquaintance with interdisciplinary research environments.
- Ability to use scientific instrumentation and interpret results.
- Ability to develop original, independent and critical thinking.
- Ability to formulate questions, to give structure to a scientific argument, to find adequate methods and theories for tackling problems.

Complementing scientific proficiency, transferable key competences include the ability to effectively advance in an industrial or government environment, to act self-dependently, and to have leadership capabilities. The doctoral candidate would therefore be responsive to training in the following issues:
- The planning process – objectives, strategies, policies, decision making.
- The structure and process of organising – authority vs. self-contained work, organisational flexibility, adaptability to novel situations, time management.
- The management of human resources – qualifications vs. requirements, orienting new team members, team building, organising individual tasks and duties, formulating motivation strategies.
- The management of information – analysis, evaluation, synthesis and selection of complex concepts and facts.
The communication process – communication skills (including presentation techniques, language skills, writing of project proposals and reports), tutoring and training skills, ability for knowledge transfer and interaction with peers, audiences & panels, the scholarly community & society in general under multilingual conditions.

The development process – internal and external training, handling innovation.

The management of financial issues – facing budgetary and market-oriented questions, dealing with budgetary restrictions.

The process of controlling and assessing quality.

Social responsibility and ethics.

The introduction of adequate reliable ‘Bologna tools’ in the third cycle is further reinforcing the contribution of higher education to the process of innovation by creating a frame permitting universities, eager to exchange systematically knowledge and skills for the benefit and through the mobility of early-stage researchers, to have full intelligibility in methodology and tools.

Proposal on how to use ECTS credits in third cycle studies in chemical sciences

In view of the student-centred approach, which lies in the essence of the Bologna Process, and of the overall tendency to allocate ECTS credits at doctoral level – it should be considered to which degree and within which frame credit allocation is advantageous for doctoral candidates in chemical sciences within the European Higher Education Area.

In this context, and while taught educational components are easily ‘measurable’, it must be emphasised that the research part forms one integral non-modularised learning activity. Actually, in the third cycle the workload is not connected to time, but reflects the total effort done by the candidate in order to complete his research. If administrative requirements proceed to the allocation of ECTS credits per semester or year, attention should be called to the fact that this splitting up does not quantify progress in research, and fragmentary credit award is nominal and provisional.

Proposal on how to implement the Diploma Supplement in third cycle studies in chemical sciences

In the third cycle, the Diploma Supplement becomes essential whenever the candidate has followed structured doctoral studies involving a taught component or encompassing mobility initiatives. In an analogous setting, it is a most advantageous way for systematising the results of joint degrees. Under all these circumstances the learning outcomes outreach by far the thesis and the subsequent expertise in a well-defined scientific area, since they include a varying number of transferable competences, namely core research skills along with personal and professional proficiency. As a matter of fact, the question arises the more often among stakeholders as to what type and level of knowledge, skills and mind-settings an early-stage
researcher has acquired during his doctoral years. A Diploma Supplement completed by a portfolio would definitely increase transparency and foster employability.

Taking into account that the Diploma Supplement is a flexible, non-prescriptive tool, capable of adaptation to local needs, it should be considered to which degree and under what circumstances it is beneficial for young scientists, who are about to be awarded the doctoral degree.

In this context, and in order to facilitate Diploma Supplement issuance even the case of non-structured doctoral studies in chemical sciences, **explanatory remarks to the Diploma Supplement model** are proposed in form of footnotes, based on the above-cited concepts and on a large number of actual examples.

**I. OUTLINE STRUCTURE FOR THE DIPLOMA SUPPLEMENT**

This Diploma Supplement model was developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international ‘transparency’ and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free from any value judgements, equivalence statements or suggestions about recognition. Information in all eight sections should be provided. Where information is not provided, an explanation should give the reason why.

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<tr>
<th>1</th>
<th>INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION</th>
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<td>Family name(s):</td>
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<td>1.2</td>
<td>Given name(s):</td>
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<td>1.3</td>
<td>Date of birth (day/month/year):</td>
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<td>1.4</td>
<td>Student identification number or code (if available):</td>
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<th>2</th>
<th>INFORMATION IDENTIFYING THE QUALIFICATION</th>
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<td>2.1</td>
<td>Name of qualification and (if applicable) title conferred (in original language):</td>
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<td>2.2</td>
<td>Main field(s) of study for the qualification:</td>
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<td>2.3</td>
<td>Name and status of awarding institution (in original language):</td>
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<td>2.4</td>
<td>Name and status of institution (if different from 2.3) administering studies (in original language):</td>
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<td>2.5</td>
<td>Language(s) of instruction/examination:</td>
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<th>3</th>
<th>INFORMATION ON THE LEVEL OF THE QUALIFICATION</th>
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<td>Level of qualification:</td>
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<td>3.2</td>
<td>Official length of programme:</td>
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The official length may be strictly defined, or else presented ‘in principle’ or ‘approximately’. If possible, ECTS credits should clarify the workload. If no official duration is foreseen, this should be mentioned. In such case, the total student effort required may be described on the basis of the relevant ECTS credits. If national regulations do not foresee/allow credit allocation to the total or the research part of doctoral studies, the issue is referred to paragraph 4.2.

3.3 Access requirement(s):

4 **INFORMATION ON THE CONTENTS AND RESULTS GAINED**

4.1 Mode of study:

4.2 Programme requirements:

The official length may be strictly defined, or else presented ‘in principle’ or ‘approximately’. If possible, ECTS credits should clarify the workload. If no official duration is foreseen, this should be mentioned. In such case, the total student effort required may be described on the basis of the relevant ECTS credits. If national regulations do not foresee/allow credit allocation to the total or the research part of doctoral studies, the issue is referred to paragraph 4.2.

4.3 Programme details: (e.g. modules or units studied), and the individual grades/marks/credits obtained: *(if this information is available on an official transcript this should be used here)*

A portfolio is prepared including the following information:

- Publications (title, abstract, reference).
- Taught/organised component (transcript of courses and relevant marks/credits).
- Mobility forming official part of the programme (frame, outcomes).
- Tutoring activities forming official part of the programme (list).

4.4 Grading scheme and, if available, grade distribution guidance:

If national regulations do not foresee/allow credit allocation to doctoral studies, this should be mentioned.

4.5 Overall classification of the qualification *(in original language)*:

If national regulations do not foresee/allow classification for the final qualification, this should be mentioned.

5 **INFORMATION ON THE FUNCTION OF THE QUALIFICATION**

5.1 Access to further study:

5.2 Professional status *(if applicable)*:

6 **ADDITIONAL INFORMATION**

6.1 Additional information:
Mobility, tutoring activities, participation in intensive programmes or award of distinctions relevant to the qualification, but not forming official part of the study programme, should be included in a *portfolio*, whose contents are attested by the supervising body and/or the board of examiners.

6.2 Further information sources:

7 CERTIFICATION OF THE SUPPLEMENT

7.1 Date:
7.2 Signature:
7.3 Capacity:
7.4 Official stamp or seal:

8 INFORMATION ON THE NATIONAL HIGHER EDUCATION SYSTEM

*(N.B. Institutions who intend to issue Diploma Supplements should refer to the explanatory notes that explain how to complete them.)*

With the explanatory remarks taken into careful consideration, most sections in the overall structure of the Diploma Supplement need no further clarification in order to be effectively used for third cycle studies in chemical sciences. Nonetheless, in actual examples two items do not appear to cover all issues.

In fact, information included in item 4.3 is usually simply referring to the Transcript of Studies, or is proceeding to a general depiction of programme details. In the third cycle, the Transcript of Studies is not always fully presenting all study/research outcomes, while overall descriptions lack the necessary individualisation. It is recommended that item 4.3 takes the form of a short portfolio including the following: Thesis (title, abstract, reference, supervising body, board of examiners); Publications (title, abstract, reference); taught/organised component (transcript of courses and relevant marks/credits); mobility forming official part of the programme (frame, outcomes); tutoring activities forming official part of the programme (list).

Furthermore, item 6.1 is practically never considered as an opportunity to complete the holder’s profile. However, chemical scientists who are about to be awarded the doctoral degree can often give proof of mobility, tutoring activities, participation in intensive programmes or award of distinctions relevant to the qualification, which do not form official part of the study programme. Once these activities are attested by the supervising body and/or the board of examiners, it is recommended that they should be referred to under item 6.1.