

Flexible and Individual Curricula in Molecular Science

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Introduction

The Freie Universität (FU) Berlin has approximately 35,000 students in bachelor and master's courses and offers studies in all fields of Science, Art, Law, and Economy. In the last decade it has put its effort into internationalization, and already at the undergraduate level there are approximately 20% students from abroad. At the PhD level, the number of students from abroad is even higher.

Unlike the Anglo-Saxon system, admission to a PhD program in Germany is for the most part only possible with a master's degree. About a decade ago, nearly all doctoral candidates did a so-called individual PhD linked strongly to the supervisor and his research field. There was no curriculum offered for these individual doctoral studies and the task of the doctoral candidate was to carry out research and write a thesis. The situation has greatly changed in the last two decades, mainly due to an initiative by the German Science Foundation and efforts by other granting agencies, which offered and still offers special grant programs for graduate schools with the focus on the doctoral education of PhD students in a selected research topic.

Dahlem Research School: The situation at the FU Berlin

The Dahlem Research School, which is the umbrella organization for, at the moment, 23 doctoral programs in all fields of Natural Science, Arts, Social Sciences, and Economics at the FU Berlin, historically grew out of a graduate school in chemistry established in 2001 and funded during the first five years by the German Academic Exchange Service (DAAD). On the basis of this experience the Dahlem Research School of Molecular Science was founded, and at the moment comprises four PhD programs in the field of Molecular Science. The concepts developed there in the last decade have been used to establish a comparable framework for all doctoral programs at the FU Berlin, which are assembled under the roof of the Dahlem Research School. There are three pillars— Humanities, Social Sciences and Area Studies, and Natural and Life Sciences— all containing several individual PhD programs.

Currently, more than 900 doctoral candidates are members of the Dahlem Research School, about one-third of the students coming from abroad. There are still more doctoral candidates at the FU Berlin carrying out individual PhDs, but the number of PhD students within the PhD programs is growing continuously. For example, in 2013, there were 110 PhD students in Molecular Science, a joint PhD program of the faculty of Physics and the faculty of Biology, Chemistry, and Pharmacy.

Curriculum Development

According to a report published by the European Physical Society in 2011, more than half of the doctoral candidates aim for a postdoc position in academic research and about one third plan to go to industry. Almost 40% of the doctoral candidates plan to stay abroad or move abroad after their doctorate. For Chemistry, the percentage of doctoral students planning to go to industry will

be higher, because of the importance of chemical industry especially in Germany (Kehm & Alesi, 2011).

Regardless of whether young scientists stay in academia or work in industry, they will have to do their work in an interdisciplinary environment, in collaboration with other scientists from all over the world. Thus, a chemist must be able to speak to a biologist, to a physicist, and at times even to an economist or a lawyer. It is important that the curriculum design for doctoral students takes these new developments into account.

The guiding principle in our curriculum development for the Dahlem Research School Molecular Science was that the contents cannot be the same for everybody in the program. Therefore, we designed a kind of enveloping structure by indicating which kinds of courses should be followed, e.g., an interdisciplinary seminar, maybe a course from the master's program, courses on transferable skills, etc. This general scheme will be put in concrete terms on an individual basis via the tuition contract for the PhD student. So, in agreement with the PhD student and the supervisors (there are always at least two supervisors in the mentoring agreement between the student and the university), an individual and flexible curriculum is designed. In most cases it contains obligatory parts, like scientific colloquia, seminars, and special lectures concerning the scientific topic of the PhD program, which should not exceed half of the curriculum. There is a broad range of elective courses, which can be specialized master's courses from different fields, science-related courses like scientific publishing, or training courses in presentation skills. But there is also the possibility to attend selected language courses, or science courses in patent law, depending on the future direction the student is likely to take. General soft skills courses are offered by the Dahlem Research School for all PhD students, the topics comprising research integrity, teaching and higher education, career development both for academia and industry, and special courses for women in science and for international students.

The workload should be relatively low, about five credit points per term, so that students can concentrate on their research work for the PhD thesis, publish results, and write the thesis. Because of the flexible and individualized nature of the curricula of PhD programs at the FU Berlin, the demand of e-learning is not high. Up to now, no special e-learning tools have been developed for PhD programs. But of course the topic shows up in the courses for teaching and higher education. Especially at the bachelor and master's level, the FU provides tools to offer or support courses with elements of e-learning.

Summary

As a rule, joining the PhD programs offered by the FU Berlin requires a master's degree. Therefore, the curricula of the individual PhD programs are very individual and flexible with only very few obligatory elements. Due to these constraints, there is currently no need to develop new tools on the basis of e-learning for the curricula of the PhD programs within the Dahlem Research School.

Reference

Kehm, B. & Alesi, B. (2011). The implementation of the Bologna process reforms into physics studies in Europe: The doctoral level. *European Physical Society Report*, 5-6.