

# Titel: International Undergraduate Research Projects

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## 1. Context:

Undergraduate studies at any European or German research university are a (relatively) new “concept”: Following the Bologna Declaration of European Ministers of Higher Education, European universities introduced Bachelor and Master degrees in all fields of education. Traditionally favoured degrees, like the “Diplom Ingenieur” in German engineering education, will not be awarded any longer. With this new structure of study programs and degrees, European higher education strives to become more comparable and in the same way more competitive with other higher education systems in the world. Furthermore, the future graduates should be better prepared for the workplace and prepared for lifelong learning.

In 2004 a “Joint Quality Initiative”, consisting of administrators of different European countries and different institutions involved with quality assurance, developed descriptors for the new Bachelor’s, Master’s and Doctoral degrees in Europe ([www.jointquality.org](http://www.jointquality.org)). The goal of this initiative was to describe the expected outcomes of each qualification level (Bachelor’s, Master’s, Doctoral Degrees) which is named “first, second and third cycle” degrees in the European qualification framework. In 2005 the states and the federal state of Germany adapted and accepted these descriptors as the overall framework for all degrees awarded at German universities. The overall German Qualification framework ([www.hrk.de](http://www.hrk.de)) defines expected outcomes for undergraduate programs. The framework includes the description of expected competences of Bachelor’s programs regarding knowledge and understanding, communication and social skills (among others).

## 2. Research Questions:

The intended reform of undergraduate education at European universities in the framework of the “Bologna Process” most frequently didn’t include the thoroughly discussion and reform of new ways and models of learning, like problem based learning. Especially the engineering disciplines at German research universities struggled heavily with the reform of teaching and learning styles. Undergraduate Research Projects - based on the reflection of how learning takes place - are therefore – with a few exemptions – a relatively new concept in German engineering education: They are not yet overall defined in their scope, methodology, and their input in this new environment of undergraduate studies.

Undergraduate Research is not a new concept at several US research universities, especially not in engineering. But also here, the scope, the methodology and the assessment differ between universities. In most cases in the US, the undergraduate research projects are focused on the own individual student population and don’t include (mostly) an international component. In contrast, European universities include internationalization and international exchange of students as a fixed element of European Higher Education but have to gain ground in reflecting teaching and learning styles especially regarding undergraduate research.

The research to be presented at the symposium will focus on the following questions:

1. Is there a common ground for “international standards” for undergraduate research (at home and abroad) regarding the expected outcome and assessment of results?
2. Does the different approach in engineering education in the US and Europe influence the conduct of undergraduate research?
3. How does personal, social and subject-related learning as part of any Undergraduate Research Project, change when it is conducted in another cultural environment?

3. Theoretical framework: To answer these questions, the study will collect defined assessment frameworks of US undergraduate research and discuss their possible application in European shaped undergraduate curricula. Possible limits are discussed on the background of common European accreditation standards for undergraduate programs. The framework of “problem-based learning” and its application to learning in a different cultural environment will help to analyze the inherent potential of any URP as well as its limitations.

The assessment of the first Undergraduate Research Program (UROP International) at RWTH Aachen University will observe the different behaviour of US and German students in structured URPs regarding subject-related, personal, social and intercultural skills. The learning process of faculty involved in the new concept of Undergraduate Research will be considered as well.

4. Findings and conclusions: Reflecting on the available and applicable criteria for outcome assessment in engineering education (as well as for accreditation) there seems to be a potential in adjusting the frameworks for undergraduate research projects in engineering in the US as in Germany (and probably Europe). The adjustments have to take place in easing restrictions on conducting undergraduate research projects (in the US) and on the other hand in “tightening” an loose understanding of the value of undergraduate research (in Europe). In total, engineering students as well as faculty will profoundly gain important understanding, knowledge, and skills when undergraduate research will be appreciated as an important part of the most fascinating global enterprise: scientific research.

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