

The reform aimed at standardizing European higher education degrees based on two main cycles: bachelor's and master's degrees to make degrees easily understandable and comparable. Also, a uniform credit system based on ECTS was developed to maximize comparability.

These and other means aimed at increasing the international competitiveness of the European system of higher education, fostering mobility of students and university staff among its member states and providing a system to encourage employability opportunities within Europe (European Ministers of Education 1999). Finally, it offered a consolidated basis for higher education systems to collaborate with each other in teaching, learning, and research.

German Higher Education: An Overview

Germany has nearly 81 million people who live in a rather densely populated area in central Europe. The country is faced with an aging population, thus the demographic change is a crucial area of interest to society as the need for qualified and technically skilled employees and workers is steadily growing, but the number of people is continually decreasing. This demographic change is also depicted in higher education.

Germany is undoubtedly one of the winners as far as attaining an upper secondary education is concerned. More than 95 % of the students between 20 and 30 complete upper secondary education, half of them with a higher education entrance qualification (Destatis 2018).

However, the enrollment and graduation rates of higher education are surprisingly much lower as the average OECD statistics. The main reason is that Germany has a very well developed vocational training education that students and parents see as an excellent alternative to academic higher education. In fact, employment rates hardly differ among graduates from technical or vocational dual education programs or those from tertiary education (OECD 2017).

Access to Higher Education: The Social Gap Continues to Decline Insignificantly

In 2018, the German Centre for Higher Education Research and Science Studies (Kracke, Middendorff et al 2018) revealed that 79 out of 100 students entering higher education in Germany have parents with an academic background. The report concludes that selection based on the social background starts at a very early stage in primary school already and continues throughout secondary school. Students whose parents have a vocational education background are less likely to enroll at university compared to those students where at least one parent has graduated from an academic-oriented secondary school, known as Gymnasium in Germany. It further shows a correlation between students with migration background struggling more to achieve an academic-oriented education than those from families that speak German at home (Kracke, Middendorff et al 2018). This study complements the PISA studies conducted in 2000 by the OECD (Stanat, Artelt et al 2002).

The PISA results of 2000 shocked Germany society and are still causing an ongoing pedagogical debate on how to reform German education. The study examined the

competencies and skills of 15-year old students in reading, math, and natural sciences in more than 200 countries. Germany ranked below the OECD average in reading, math, and natural sciences. The clear winners were mainly Scandinavian countries, headed by Finland, and East Asian countries, with top contenders Japan and Korea. For nearly 20 years, a wave of continual educational reforms in secondary education was based on the disastrous results presented in the OECD study. It took away the self-confidence of many educators. Numerous changes were implemented that included an extension of school operating hours to include afternoon schooling, offering hot meals and cafeterias, as well as supervision for children of working parents. Secondary schooling was reduced to an eight years instead of nine to adjust to other nation's secondary school system, claiming that German graduates from secondary school were too old to enter higher education making them less attractive compared to other European country graduates.

Comparing the results of the DZHW study (Kracke, Middendorff et al 2018) and PISA 2000 (Stanat, Artelt et al 2002) shows that Germany is still struggling with the issues of social equality in secondary education. The challenges of students with a migration background have significantly highlighted the discrepancies between children of parents with a non-academic background and those with an academic background. The social inequality furthermore demonstrates the need to develop different strategies that include new approaches in secondary and higher education and it also involves political debates on state as well as federal government level. As seen in these two studies, Germany has been able to close the gap only slightly within the past 18 years. In addition to the demographic challenges described earlier, it needs to reassess its approach to teaching and learning (Stanat, Artelt et al 2002).

A Brief History of Fachhochschulen (UoAS)

Nearly 50 years ago, Fachhochschulen, referred to as Universities of Applied Sciences (UoAS) in English, were founded to meet the demands of a growing population that should receive academic qualifications focusing more on professional training and work-related competencies rather than on a more traditional research-oriented approach. Germany was in dire need of qualified employees for its growing industry. The increasing demand for qualified engineers called for a more hands-on approach to learning and gave way for new educational qualifications that should not be predominately reserved for men of the middle or upper class. In the late 1960's, the idea of providing higher education to all members of society was starting to be considered a civil right in a modern social democracy. Education reforms stressed that excellent education should be crucial and offer equal opportunities to all. This development was the beginning of an applied teaching and learning approach for business and technical skills at an academic level and gave way to establishing the need for German Universities of Applied Sciences, where studies are characterized by an emphasis on practical methodological approach and shorter study durations. Later, applied research – in contrast to fundamental research at universities – became an additional feature for Universities of Applied Sciences.

Higher Education Reforms and ECTS

By the 1990's, German higher education underwent the most significant reform in its history by changing the degrees granted from a "Magister" as well as diplomas to a standardized EU system of granting bachelor and master degree programs. This reform is known as the Bologna Process. The reason for standardizing European higher education was to foster mobility among its member states and to provide a system to encourage employability opportunities within Europe. Finally, it offered a unifying basis for higher education systems to collaborate with each other in teaching, learning, and research.

The German Diploma Degrees (e.g., the highly respected Dipl. Ing.) were replaced by Master of Science or Master of Arts and various new undergraduate degrees previously not offered in Germany were introduced. The German Diploma was equivalent to a master's degree in the Anglo-American educational system. The overall EU policy to adapt to a European Model of Transfer of Credits (ECTS) enabled more considerable scale mobility between universities in Europe and encouraged all member states to adapt to a standard credit system. These reforms required Germany to completely revamp its curriculum to offer three-to-four year bachelor degrees and establishing a standardized master's program that is now comparable to other degrees within Europe.

With this development, the Fachhochschulen (UoAS) were now being legitimized as Universities of Applied Sciences and were granted the right to award bachelor's and master's degrees that were equivalent to those attained at a traditional German university. This harmonization process gave UoAS a new international facelift and also started the debate in Germany of expanding the right to grant doctoral degree programs for UoAS, which up to then had exclusively been reserved for research-oriented universities in Germany. Recently, full granting universities have been encouraged by the government to engage in cooperation agreements with UoAS to jointly embark on applied research projects in their related field. The state government is actively funding these developments in the field of joint research activities as UoAS contribute to applied research in their respective local communities and work closely with industry and business partners. Graduates from UoAS involved in research should be able to continue their academic studies. Currently, this cooperation model is being discussed as a form of uniting higher education research efforts in offering applied research opportunities that are embedded in the region with a focus on supporting the collaboration of both universities and Universities of Applied Sciences (MIWFT NRW 2011).

Current Trends in Higher Education in Germany

Older "German FH Diplomas" are now replaced by the new ECTS system. The new system has enabled German students to study in other countries within the European Union as well as opening doors for international students in Europe for receiving different funding opportunities provided by Erasmus grants. This change gave UoAS a different standing and standardized higher education within Europe. Critics have raised issues that ECTS offers a system that is focused mainly on monitoring and labeling hours spent learning instead of

encouraging developing independent deeper learning. Some educators feel that the credit system resembles a school-like learning approach that is not flexible enough to incorporate academic exchange and discourse.

Employability

Employability has been a critical driving force for European higher education reforms. In the international context, studies published by the Horizon Report show that a very similar tendency is observed as part of the global agenda in higher education. The trend towards entrepreneurial education initiatives and practical teaching methodology combined with a solid theoretical academic background in international educational discourse make UoAS more and more attractive and establish their standing in higher education pedagogy and research worldwide. These new trends also include focusing on teaching the competencies needed in international business and research activities. Junior researchers can enroll in so-called cooperative doctoral programs after completing their master's degree at a UoAS. Thus, UoASs have established themselves as innovation centers in the region and give impulses for the regional development of SMEs (MIWFT NRW 2011).

Driving Innovation

Federal and State Government want to encourage innovation and the transfer opportunities offered by universities of excellence and initiated a 550 million euro funding scheme. A Public Administration Agreement from 19 October 2016 between the Federal Government and the 16 States in Germany supports a research-based transfer of ideas, knowledge, and technology to the regional communities and industry. It aims at supporting mainly UoASs with a 550 million funding scheme (Innovative Hochschule 2016). In 2017, Hochschule Bonn-Rhein-Sieg, University of Applied Sciences was awarded a 9 million euro grant to establish itself as one of the innovation centers in NRW. It was selected for its Campus to World and Innovation Mall concept that will offer a toolkit and establish networks to meet the demands of the community and establish research activities and the flow of innovation to take place in- and outside the university (<https://www.h-brs.de/de/das-projekt-campus-world>).

Digitalization

The digitalization process is affecting society as a whole. There is hardly any part of modern society that is not affected by digitalization. Processes and structures in business and industry will change rapidly to remain competitive in the so-called 4th Industrial Revolution. The way of communicating, learning, and working will also differ from today. Higher education institutions must also adapt their educational systems to serve the needs of society, employers, and students. For them, "digitalization" marks a fundamental process of change, which includes, for example, existing concepts for acquiring and identifying knowledge and skills, understanding roles and structures of organization and cooperation in and around universities as well as political framework conditions" (Hochschulforum Digitalisierung 2015).

University of Applied Sciences in North Rhine-Westphalia (NRW)

Germany has a state-run education system. Each of the 16 states is thus responsible for its own higher education. The State of North Rhine-Westphalia has 16 Universities of Applied Sciences (UoAS), which includes Hochschule Bonn-Rhein-Sieg, University of Applied Sciences (H-BRS) with 9,000 students. Slightly more than one-fifth of all students graduating from secondary school attend one of the UoAS. The state government has financially committed itself to supporting the expansion of UoAS. Ensuring the long-term goal of reaching a 4:6 ratio between applied universities and full universities requires a robust financial commitment. UoAS have been running on around 150 capacity overload with a permanent increase in enrollment. By 2020 nearly 35 billion euros will be invested in expanding UoAS through state funding schemes. These two separate initiatives: Higher Education Pact I & II (Hochschulpakt I and II) were initiated as short-term funding shots that are expected to be offered permanently once the funding duration ends. According to the latest figures nearly every fifth student graduates from a UoAS in NRW.

Public Universities of Applied Sciences in NRW

Statistics NRW	1971	2007	2010	2014
Student enrollment	n.a.	90 236	103 416	151 343
UoAS	8	12	16	16
Academic staff	< 2 000	6 227	8 931	13 181
Professors	n.a.	2 115	2409	2 802
Graduates	n.a.	13 778	17 179	19 252

Table 2: UoAS Statistics for North Rhine-Westphalia (Source IT.NTW, 2007, 2011, 2017)

The state government feels that the UoAS should be responsible for tailor-made higher education programs that are geared towards the needs of the communities and also meet the demands of the local workforce. As many SMEs are export-driven businesses, the UoAS need to establish global competencies that are internationally competitive. UoAS are actively involved in applied research, and this is no longer reserved exclusively for universities. UoAS are important stakeholders and partners for businesses and organizations and work closely with SMEs. Cooperation between industry and academia is a link to establishing more applied research activities and encourage innovation to take place in Germany. The current government is committed to strengthening offering resources to encourage more development in this area.

Future Challenges

One of the challenging aspects of employability universities will have to deal with will be the faster pace of change in industrial processes and expert knowledge in the future. Although German UoAS seemed to have adopted “more rapidly to the needs of the knowledge-based-economy”, compared to other European institutions of higher education (Paul 2002), the evolution is not to stagnate. Life-long learning and work-based learning are both trends that

need to be addressed, for example by offering more flexible learning schedules for students or short tailor-made qualifications or certificate studies for post-graduates. Competency-based learning needs to be further established and promoted within an academic context and supported by modern learning environments and tailor-made learning formats.

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