Dual study course in civil engineering education in Germany - chance or risk?

Karl Mallwitz

Hochschule Wismar - University of Applied Sciences Technology Business and Design
Wismar, Germany

ABSTRACT: This article presents developments and concepts in dual study courses in civil engineering education and the first findings and conclusions. Presented is an overview of dual study courses in Germany with special emphasis on civil engineering. Dual study courses in the German higher education context are illustrated, classified and explained. All in all, alumni of dual study courses stand a chance, whereas the chances of success for universities of applied sciences appear to be less in order to provide a homogeneous basis for advanced studies. In order to maintain the education at the highest level, quality assurance for both universities of applied sciences and universities is proposed.

INTRODUCTION

Effective higher engineering education is essential for further development at a technologically advanced level. Therefore, it is important to establish the extent to which new models, such as dual study courses are effective in higher engineering education. Will dual study courses prove to be an effective tool in increasing the output of universities in terms of graduates? At the same time the demographic prognosis is in stark contrast to the strong demand for engineers.

THE PRESENT SITUATION IN GERMANY

Dual study programmes comprise both Bachelor's degrees and training qualifications in a fixed time frame. Dual study programmes in general are offered on a somewhat broader platform than in the past by their implementation in universities of applied sciences, as well as in universities.

Civil engineering dual study programmes are offered at three universities (Wuppertal - since 2007, Siegen - since 2010 and Kassel), as well as at 43 universities of applied sciences [1]. The predominant part of dual study courses in civil engineering with 93.5% is on the side of the universities of applied sciences, whereas the universities hold 6.5%.

Generally, the apprenticeship in a dual study course is independent of paths to advanced studies. Bachelor students from universities can change to Master's programmes at universities of applied sciences and *vice versa*. Restricting the path to doctoral studies and research by way of university is no longer obligatory, as it was in former times.

Access requirements for programmes at universities of applied sciences are no longer strictly bound to the general higher education entrance qualification (Abitur) or subject to restricted higher education qualifications for studies at universities of applied sciences (Fachabitur). Applicants without higher education entrance qualifications for studies at universities of applied sciences can pass an admission examination after completing vocational training followed by at least three years of professional work. Thus, the educational system has become an option for those young people with secondary vocational education, as universities of applied sciences enable a smooth transition between secondary and tertiary education. The assessment requirements can differ in some details between the 16 federal states because of the federal educational system in Germany.

Dual study, with a normal duration of 4 to 4.5 years, is more time consuming in comparison with conventional Bachelor's courses, which take 3 to 3.5 years to complete, but shorter when compared with running through sequential apprenticeship and academic studies. Regarding the two certificates, the time saving by taking dual study courses in civil engineering is about two years.

In general there are four types of dual study courses. They differ in extent and the degree of integrated work experience, and they involve:

- Type A - Courses of study that integrate vocational training into university studies.
- Type B - Courses of study that integrate practical work experience into university studies.
- Type C - Courses of study that are integrated into full-time employment.
- Type D - Courses of study that are conducted in tandem with employment.

Dual courses of Type A and B belong to general initial vocational education, whereas courses of Type C and D belong to continuing education. With respect to engineering education in general, overall 278 dual study courses in the year 2009 were distributed as follows: Type A - 64.7%, Type B - 29.5% and Type C - 3.6%. With respect to civil engineering in 2009, the distribution was Type A - 80.9%, Type B - 14.3 % and Type C - 4.8% [2].

The completion of an apprenticeship in civil engineering is a training qualification that has to be chosen by students in advance. Possible training qualifications include road builder, canal builder, carpenter, concrete or steel worker, mason, plasterer, tiler, floor screeder, dry construction builder, draught person, etc.

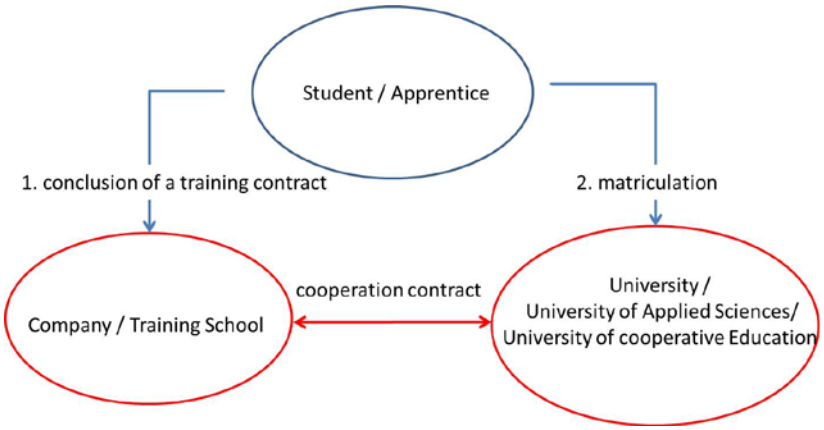

Figure 1: Dual study courses - involved parties - basic relationships and requirements.

Figure 1 shows the conditions necessary for a dual study course. As an inalienable prerequisite, the student applying for a dual study course has to conclude a contract with either a company and/or a training school, which is bound by contract to the university concerned. Matriculation cannot occur before this happens.

The schedules of dual study courses differ in extent and degree of integrated apprenticeship, dependent on the cooperation contract between the university and the company or training school.

The curriculum of the undergraduate studies in a dual study course at each university is exactly the same as the conventional engineering course offered each for Bachelor's degree. All in all, dual study courses in civil engineering either in universities or in universities of applied sciences take 4 to 4.5 years.

Table 1 shows the quantity and proportion of dual study courses by field of study as at April 2012 [1]. Figure 2 illustrates the distribution of study fields over the number of dual study courses in operation according to Table 1. Figure 2 indicates that economics is the most common discipline involved in dual study courses.

Table 1: Overview of dual study courses in Germany [1].

Dual study courses	Quantity	Percentage
Mathematics	3	0.33%
Business and social studies	8	0.9%
Engineering (general)	75	8.24%
Civil engineering	43	4.73%
Industrial engineering and management	42	4.6%
Economics	343	37.7%
Mechanical engineering	150	16.5%
Traffic engineering/nautical science	13	1.4%
Computer science, IT	111	12.2%
Social work	31	3.4%
Electrical engineering	91	10.0%
Total	910	100%

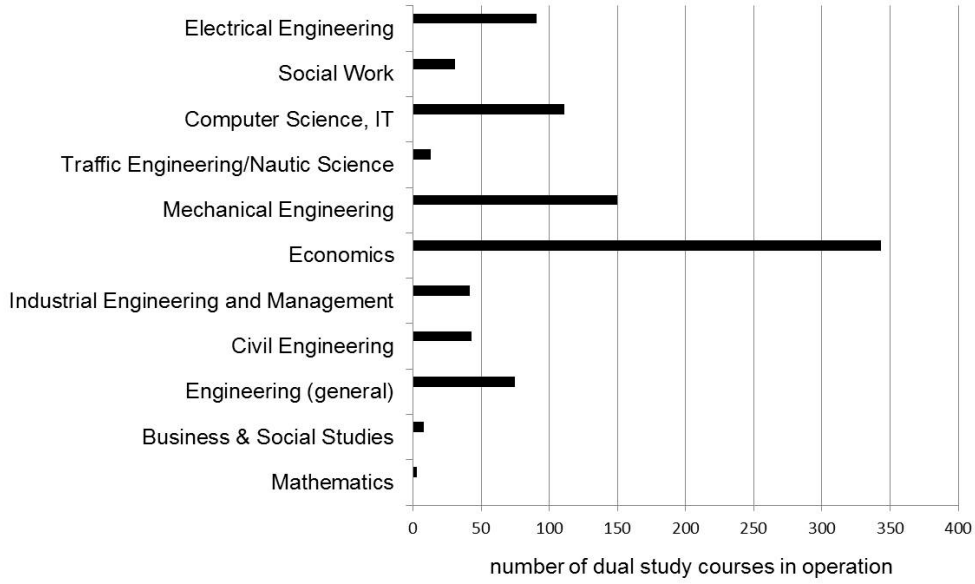

Figure 2: Distribution of German dual study courses in 2012.

Regarding the quantities of study courses based on Table 1, Figure 3 shows with respect to mechanical, electrical, civil engineering and engineering (general), that civil engineering with 12% represents the lowest proportion of dual study courses within the *family of classical engineering*. Figure 3 also shows that dual study courses in mechanical engineering are the most common.

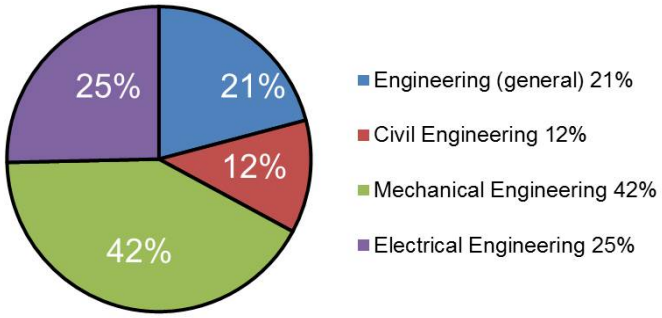

Figure 3: Proportion of *classical engineering - fields* involved in dual study courses.

CHANCE OR RISK?

This question applies to all partners involved in dual study courses outlined in Figure 1, as well as to education policy specified by constraints and procedures set out in the educational system. The chance and risk for the involved parties are outlined below.

Student/Apprentice

Dual study courses prove to be an excellent offering to those students who have a simultaneously strong interest in both the theoretical approach and the practical approach in engineering science and practice. Dual study courses are more related to practical experience in comparison with full-time studies at universities. Furthermore, many dual study courses are funded by companies and provide two certificates in a relatively short time range resulting in higher employability. In addition, students often have a secured engagement in a company with higher career opportunities.

A student can run a risk in choosing an apprenticeship not relevant to the surroundings he/she plans to live in, in the future. This might apply to regions with low economic and industrial activity. On the other hand, comparatively speaking, dual study courses involve more stress for students, because of changing training places in combination with a condensed educational programme.

Companies

Students for dual study courses can be pre-selected by a qualifying examination, especially in the case of funding. Their apprenticeship is tailored for the needs of the company. As a result the company has a highly skilled employee, incorporated in the company.

Universities and Universities of Applied Sciences

Students involved in dual study courses generally increase the number of students needed for success and feedback in the context of public or educational funding. Per-capita funding is given to universities and universities of applied sciences.

A risk can arise if the number of students in dual study courses is very low and does not justify the additional effort of management that is necessary. An important issue in this context is that the diversity of training qualifications that defines the attractiveness of dual study courses respectively, strongly depends on the economic and industrial strength of the area surrounding a university site. Therefore, dual study courses offered in regions with low economic and industrial potential presumably will be less effective, concerning the quantity of students.

This could be a reason why popularity and demand for dual study courses are lower than expected, based on the experience at Hochschule Wismar - University of Applied Sciences Technology Business and Design, where dual study courses in civil engineering started in 2008. The average rate of dual students is seven students per year. The coming years will show if the present findings are valid.

Experience over the past few years indicate that most of the dual study participants eventually have a predominant interest in practical application and experience, and less affinity with the theoretical approach. As a consequence, there is a risk of declining academic standards in the theoretical part of the Bachelor degree that could jeopardise the dual concept for fear for losing educational funding. Consequently, the Bachelor degree turns out to be something of an *appendix* and, therefore, a somewhat diminished and mediocre qualification for optional advanced studies (i.e. Master's degree courses in either universities of applied sciences or universities).

The latter finding could become a risk that increases the gap between the image of universities of applied sciences and universities concerning the educational and academic level, and counteracts further development and cooperation. The chances of success for universities of applied sciences appear to be less in order to provide a homogeneous basis for advanced studies within the Bologna Process.

Education Policy

The main task of dual study courses is to improve the employability of young people and to increase the output of universities in terms of graduates, as Germany with a tertiary level graduation rate of 30% is still below OECD average of 39% [3]. In addition, dual study courses can be regarded as an effective tool in reducing public funding in higher education, due to private funding by companies utilising this educational option. The question, however, is to what extent dual study courses are to become a success story for all federal states in all engineering disciplines, remains to be seen. Dual study courses in engineering appear to be less risky for all involved parties in densely populated areas with industrial agglomeration.

CONCLUSIONS

Dual study courses prove to be an excellent option for those students who simultaneously have a strong interest in the theoretical approach, as well as a strong interest in the practical approach in engineering science and practice. All in all, students have more options from dual study courses, and companies have an excellent chance to handpick highly skilled employees. However, the chances of success for universities of applied sciences appear to be less if the aim is to provide a homogeneous basis for advanced studies in relation to universities. The reason is the per capita public funding provided to institutions.

This procedure generally counteracts education at the highest stage. The latter should be taken into account for engineering education in both universities and universities of applied sciences. To counteract this effect without endangering the pervasiveness of the education system by retaining the access requirements to universities of applied sciences, it would be useful to install a quality assessment for both universities and universities of applied sciences. This holds particularly well for engineering degree programmes, as well as civil engineering in order to guarantee an education at the highest level. Quality assurance is mandatory, although difficult to become accepted in the context of the federal higher educational system in Germany. For the moment, further development of dual study courses in civil engineering remains to be seen with focus on quality and quantity respectively.

REFERENCES

1. Goeser, J., Brengmann-Domogalla, H., König, M. and Verhey, V., *AusbildungPlus in Zahlen, Trends und Analysen 2012*. Bonn: Bundesinstitut für Berufsbildung BIBB (2013).
2. Kupfer, F. and Mucke, K., *Duale Studiengänge an Fachhochschulen nach der Umstellung auf Bachelorabschlüsse- Eine Übersicht*. Stand: Herbst 2009; Bonn: Bundesinstitut für Berufsbildung BIBB (2009).
3. OECD, *Education at a Glance 2012: OECD Indicators*, OECD Publishing (2012), http://dx.doi.org/10.1787/eag-2012-en