ANALYSIS OF DUAL HIGHER STUDY PROGRAMMES IN GERMANY, AUSTRIA AND SPAIN AND RECOMMENDATIONS FOR WEST BALKAN COUNTRIES

Dr.sc. Louise Sperl
World University Service - WUS Austria, Graz

Mag. Almir Adi Kovacevic, MA
WUS Austria Graz

Prof.dr Darko Petković
Innovation and Entrepreneurship Centre at University of Zenica

ABSTRACT
This research give on the state-of-the-art in dual higher education includes results from information provided on 15 dual study programmes in higher education from programme countries in different industrial sectors. Each of the three EU countries (Austria, Spain, Germany) has analysed 5 study programmes which are being implemented at the respective partner university and at other universities in the programme countries. In this article we also elaborates the concept of "Dual Higher Education (DHE)" and the overall framework for dual education at the respective universities and beyond. Finally, the article concludes with a short summary and conclusions regarding options for DHE programmes in the Bosnia and Herzegovina.

Key words: Dual higher education (DHE), analysis, EU countries, experiences, recommendation

1. INTRODUCTION

This research was realised inside Erasmus+ Dualsci project and gave state-of-the-art in dual higher education programmes across different EU countries (German, Austria and Spain). Dual Higher Education is an approach that formally integrates students' academic studies with work experience in enterprises/industry. This approach to education relies upon a three-way partnership: the student, the Higher Education Institution and the employer. The exact format of collaboration is usually established in specific agreements between the company and the HEI, outlining the number of students received by the company (e.g. 10 to 20), whether students work for free or receive a salary, the number of hours per semester (e.g. 150-300) and other rights and responsibilities of students and the company. Companies are also expected to find mentors for students who will be able to guide them during their practical work at the company and who assess their work at the end of the semester. There is no obligation to employ students after their education.

The following types of learning concepts or models are often used in vocational/technical education related to work based learning[1]:

- **Curriculum-integrated learning:** Is amodel of learning that describes the development ofintegratedlessons helping students make connections acrosssubjects and disciplines.

[1]These concepts have been also defined and used by the EU project ApprenticehipQ (www.apprenticehsipq.eu).

- **Work-related learning**: Planned activity that uses the context ofworkto develop knowledge, skills and behaviours useful inthe workplace, includinglearningthrough the experience of work, learning about work and workingpractices, andlearningthe skills forwork.
- **Work-based learning:** Is an educational strategy that provides students with real-lifework experiences where they can apply academic and technical skills and develop their employability skills.
- **Work-integrated learning:** Are forms of experiential learning where the site of learning either occurs in the workplace or where the learning is strongly associated with a workplace.
- **Cooperative education:** A term that is commonly used in North America to refer to programmes in which learners spend time in several workplaces (companies) and receive academic credit for the work experience, but in which there may be little connection between what the student does in the workplace and the curriculum of the school or college. In Europe mostly the term "Dual Education" is used. It is related to the system of apprenticeship in Germany, Austria and Switzerland. This system requires two learning venues (university and company) with a coordinated curriculum for both learning places.

These have different advantages and disadvantages: for learners, for employers, for schools and colleges, and for governments. DHE can be used to achieve a number of different objectives, such as:

- to develop vocational skills that contribute to recognised vocational qualifications;
- to develop general work habits and job-readiness;
- to help students to understand what is involved in jobs so that they make better career choices;
- to give disadvantaged people and job seekers access to opportunities to work that they might not have otherwise.[2]

A key issue for policy makers and social partners is how to choose the right type of programme for the right purpose, while best meeting stakeholders' needs. This approach to education relies upon a three-way partnership between the student,the Higher Education Institution (HEI) and the company.

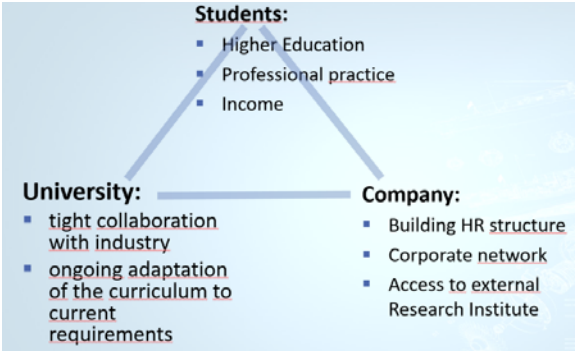

Figure 1. Key actors in Dual Higher Education
Source: Hagen Hochrinner, FH JOANNEUM, 20. 6. 2020.

[2]ETF, A handbook for policy makers and social partners in ETF countries http://ec.europa.eu/dgs/education_culture/repository/education/library/publicatioens/etf-wbl-handbook_en.pdf, 2014, chapter 4 page 13).

2. ANALYSIS OF THE 15 STUDY PROGRAMMS IN 3 EU COUNTRIES

In order to better understand the conceptual model of dual studies, 15 study programs from EU program countries (Austria, Germany and Spian) in the project of development of dual studies in BiH (Erasmus+: Dualsci) were selected. An overview of study programs is given in Tables 1, 2 and 3. Due to the limited scope of work, a complete questionnaire was not provided, which included more than 25 questions and answers for each institution.

Table 1. Analysed study programmes in dual education at the HEI in Austria

NAME OF STUDY PROGRAMME 1:	**Mobile Software Development**
Website link:	https://www.fh-joanneum.at/mobile-software-development/bachelor/en/
Name of implementing university:	FH JOANNEUM – University of Applied Sciences Graz
NAME OF STUDY PROGRAMME 2:	**PTO – Production Technology and Organization**
Website link:	https://www.fh-joanneum.at/produktionstechnik/bachelor/
Name of implementing university:	FH JOANNEUM Ges.mbH. Graz
NAME OF STUDY PROGRAMME 3:	**ENP – Engineering and Production Management**
Website link:	https://www.fh-joanneum.at/produktionstechnik/bachelor/
Name of implementing university:	FH JOANNEUM Graz
NAME OF STUDY PROGRAMME 4:	HSD – Hardware-Software-Design
Website link:	http://www.fh-ooe.at/hsd
Name of implementing university:	University of Applied Sciences Upper Austria
NAME OF STUDY PROGRAMME 5:	**Elektrotechnik Dual / Electrical Engineering Dual**
Website link:	https://www.fhv.at/studium/technik/bachelorstudiengaenge/elektrotechnik-dual-bsc/
Name of implementing university:	FH Vorarlberg, CAMPUS V, Hochschulstraße 1, 6850 Dornbirn, Austria

Table 2. Analysed study programmes in dual education at the HEI in Germany

NAME OF STUDY PROGRAMME 1:	Business Administration
Website link:	https://www.dhbw.de/english/programmes-listing.html#course-0
Name of implementing university:	Baden Wuerttemberg Cooperative State University Heilbronn
NAME OF STUDY PROGRAMME 2:	Management & Business Psychology (Betriebswirtschaft & Wirtschaftspsychologie)
Website link:	https://www.fom.de/ https://www.fom.de/studiengaenge/duales-studium/bachelor-studiengaenge-betriebswirtschaftlich/betriebswirtschaft-und-wirtschaftspsychologie.html
Name of implementing university:	FOM Hochschule für Oekonomie & Management

NAME OF STUDY PROGRAMME 3:	**Cooperative Study_Model – Degree Programm (Kooperatives Studienmodell – Bachelorprogramm) - Different combinations available**
Website link:	https://www.hs-heilbronn.de/kooperativ
Name of implementing university:	**Heilbronn University of Applied Sciences** (Hochschule Heilbronn)
NAME OF STUDY PROGRAMME 4:	Advanced midwifery science (Angewandte Hebammenwissenschaft – Hebammenkunde)
Website link:	https://www.dhbw-stuttgart.de/themen/studienangebot/gesundheit/angewandte-hebammenwissenschaft-hebammenkunde/profil/
Name of implementing university:	Baden Wuerttemberg Cooperative State University Heilbronn, DHBW Heilbronn
NAME OF STUDY PROGRAMME 5:	Mechatronics (as an example)
Website link:	https://www.thi.de/en/electrical-engineering-and-information-technology/degree-programmes/mechatronics-beng
Name of implementing university:	Technische Hochschule Ingolstadt THI, Ingolstadt, Germany

Table 3. Analysed study programmes in dual education at the HEI in Spain

NAME OF STUDY PROGRAMME 1:	**Degree in Automotive Engineering**
Website link:	https://www.ehu.eus/es/grado-ingenieria-automocion
Name of implementing university:	University of the Basque Country (UPV/EHU)
NAME OF STUDY PROGRAMME 2:	Master in Digital Manufacturing
Website link:	https://www.imh.eus/es/ingenieria-dual/master-industria-4-0
Name of implementing university:	Dual Engineering University School
NAME OF STUDY PROGRAMME 3:	Degree Primary Education
Website link:	http://www.educacionprimaria.udl.cat/en/pla-formatiu/alternanca.html
Name of implementing university:	University of Lleida
NAME OF STUDY PROGRAMME 4:	Master Degree in Informatics Engineering
Website link:	http://www.masterinformatica.udl.cat/en/pla-formatiu/FormacioDual/Formacio-Dual.html
Name of implementing university:	University of Lleida
NAME OF STUDY PROGRAMME 5:	**Degree in Process and Product Innovation Engineering**
Website link:	https://www.imh.eus/es/ingenieria-dual/grado-dual
Name of implementing university:	Escuela Universitaria de Ingeniería Dual, Basquia

In the questionary and analysis given there are also other question and answers (more than 25) as: **Joint or double degree? Yes/no – if yes, please indicate. Please indicate the occupation of graduates from this programme** (eg IT engineer, physiotherapist etc). **Please indicate economic sector where graduates are typically employed** (eg banking, insurance,

construction, health etc.). **Degree upon completion: Education programme (EQF level): Type of programme (HVET, PHE, HE): Obligatory external accreditation of the programme: Yes/no. Responsible body for accreditation: Length and overall structure of the programme: Entrance exam: yes/no. Fee: yes/no. Teaching staff from HEIs in %. Teaching staff from industry in %. Specific requirements for teaching staff** (e.g. practical experiences/managerial position in industryetc.). **Balance between education in institution & company (in % and number of days/months)-** e.g. 6 months in company or 1 day at institution and 4 days a week in company etc.). **Dual approach: Curriculum-integrated, work-related, work-based, work-integrated.** Please select appropriate answer. **Formal contracts with company (yes/no). If yes – please indicate type of contract. Payment of students by industry partners (yes/no, partly..). Support provided by the programme** (i.e service matching and career guidance). **Please indicate how/at what stages industry partners are involved in curriculum design and review** (e.g. definition of functions, competences, LOs and syllabi). **Assessment: Student assessment by HEIs (in %). Student assessment by industry partners (in %). Modalities of assessment during apprenticeship periods:**

3. COMPARISON OF DATA

Austria

In Austria, UASs are the main "owners" of DHE programs. Nevertheless, it is also possible and even not unusual for "classical" HEIs to assume a partner role in the development and implementation of DHE programs. The DHE programmes in Austria are standardised in terms of their format and layout. The majority of DHE programmes in Austria can be found in technical disciplines and follow the regular Bologna requirements (6 semesters for Bachelor programs (180 ECTS) and 4 semesters for Master Programmes (120 ECTS)). DHEgraduates have the right to continue education on Master or PhD level. The EQF Level is also unified with EQF 6 for Bachelor and EQF 7 for Master Programmes. DHE programs can also be in the format of Double or Joint Degrees. Accreditation is regulated by law and is carried out by the National Accreditation Agency. Curricula of DHE programmes are usually offered as "Curriculum Integrated models"[3]. Both, Bachelor and Master DHE Programmes are offered by UASs.[4] All programmes are developed jointly from representatives of HEIs and industry partners (IP). HEIs have the lead in the development and implementation of the programmes which is also reflected in the ratio between teachers from HEIs (60%) and IPs (40%) being involved in the educational process. Besides curriculum development and revision, IPs are also involved in mentoring the final thesis (co-mentoring together with HEI mentor). HEIs have the overall responsibility for the conduction of student assessments. The involvement of the IP in the student assessments is related to the practical part of the education (work at companies) and is not unified. IP mentors are usually supporting HEI staff by issuing recommendations for student assessments, or drafting reports based on a standardised reporting form. IPs have a direct working contract with all DHE students in line with the Austrian Labour Law. Usually Students have part time contracts (50% of the fulltime working contract). The first two semesters are usually carried out only by HEIs. Starting from the 3rd semester, the educational process is divided between HEIs and IPs with a division of approximately50:50 at Bachelor level. On the Master level, it is common for IPs to have even more responsibilities in the education of students (60:40%). Teaching Staff has to have at least 3 years of relevant Industry experience and an academic degree amounting to a minimum of 300 ECTS. The employment

[3]Curriculum-integrated learning is a model of learning that describes the development of integrated lessons helping students make connections across subjects and disciplines.

[4]Based on the existing law, UASs are not entitled to offer PhD programs.

rate after graduation is very highranging from 90 and 100% while drop-out rates are between 15 and 30%.[5]

Germany

In Germany, the DHE Programmes offered by different HEIs are not unified. The Program design and layout depend on the discipline/occupation and the approach taken by the respective HEIs. Curricula are offered in the format of "Curriculum Integrated", "Work Integrated" and "Work based" models.[6] All HEIs can offer DHE programmes at Bachelor and Master level. Programmes are available not only in technical disciplines such as engineering, but also in fields such as management, business administration and the health sector. All programmes follow the Bologna criteriabut are not unified (6 or 7 semesters for Bachelor programs (180 to 210 ECTS))and 4 semesters for Master Programmes (60 to 120 ECTS). Graduates from DHE programmes have the full right to continue education towards a Master dregree and furtherto PhD level. Some technical study programmes are aligned and combined with VET Programs. In these cases, graduates obtain a HEI and VET degree and occupation. Accreditation is regulated by the law and is carried out by the National Accreditation Agencies. All programmes are developed jointly by representatives of HEIs and Industry partners (IP). HEIs have the lead in the development and implementation of the programs which is also reflected in the ratio between teachers from HEIs (60%) and IPs (40%) being involved in the educational process including certain variations. The EQF Level is unified with EQF 6 for Bachelor and EQF 7 for Master Programmes. Some programmes also offer a VET degree at EQF 4 level. Besides curriculum development and revision, Industry Partners are involved in mentoring of the final thesis (co-mentoring with HEI mentor)as well. HEIs have the overall responsibility for student assessments.Involvement in student assessments by the IP is related to the practical part of the education and not unified in terms of modalities and format. The Industry offers training and as in the case of DHBW programmes a working contract forDHE students. Some HEIs have framework contracts with IPs and then with students (no direct IP-student contracts). In some HE-institutions, the first two semesters are carried out only by HEIs. Starting from the 3rd semester, the educational process is divided between HEIs and IPs with a division of approximately 50:50 at Bachelor level. On the Master level, it is common for IPs to have even more responsibilities in the education of students (60:40%). Teaching staff needs to have relevant industry experience and a relevant academic degree. Employment rates after graduation are very high and range between 80 and 90% while drop-out rates are between 5 and 20%.

Spain

Similar to Germany, in Spain DHE Programs might be offered by different type of HEIs (e.g. private and public). The program design depends on the discipline, the future occupation and the approach taken by the respective HEIs. DHE Programs are offered in fields such as Engineering, Education or Business Studies. Curricula are offered in the format of "Curriculum Integrated", "Work Based" and "Work Integrated" models.[7] Bachelor and Master DHE Programs can be offered by all HEIs following the Bologna Model (8 semesters for Bachelor

[5]For more information on dual education in Austria, see also www.dualstudieren.at.

[6]**Curriculum-integrated learning:** Is amodel of learning that describes the development ofintegratedlessons helping students make connections acrosssubjects and disciplines.**Work-based learning:** Is an educational strategy that provides students with real-lifework experiences where they can apply academic and technical skills and develop their employability skills. **Work-integrated learning:** Are forms of experiential learning where the site of learning either occurs in the workplace or where the learning is strongly associated with a workplace.

[7]Curriculum-integrated learning is amodel of learning that describes the development ofintegratedlessons helping students make connections across subjects and disciplines. Work-integrated learning: Are forms of experiential learning where the site of learning either occurs in the workplace or where the learning is strongly associated with a workplace.

(240 ECTS)) and 2 to 4 semesters for Master Programmes (60 to 120 ECTS). DHE programmes are not unified. All graduates from DHE programmes have the full right to continue education towards a Master dregree and furtherto PhD level. The framework of the DHE programmes is developed jointly by representatives of HEIs and IPs. In addition, IPs are in charge ofdeveloping the set of competencies for the practical part of the teaching process. The DHE programs are jointly implemented by the HEI and IPs but led by the respective HEI. The ratio between teachers from HEIs and IPs is between 50 to 75% HEIs versus 25 to 50%IPs.This,is not formally established, however, in the Basque Country, minimums have been defined. The same ratio is being applied for the involvement of HEI staff and IPs in student assessments which, however, is also not formally regulated. Involvement in student assessments by the IP is related to the practical part of the education and not unified. The EQF Level is unified and is following the EQF scheme with EQF level 6 for Bachelor and EQF level 7 for Master Programmes. In Spain, it is a common practice to have employment contracts between students and IPs or university-company collaboration agreements between HEIs and IPs. There is no standardised employment contracts for DHE.[8] A collaboration agreement is signed between the university, the company and the student, and defines the rights and obligation of the partners. Accreditation is regulated by the law and is carried out by the established Accreditation Agencies. No special requirements for the Teaching Staff have been identified. Data about employment rates are not available for all programmes (some of them have been recently introduced), but existing data show that employment rates after graduation are very high for DHE programmes (between 80 and 100 %), while drop-out rates range between 20 and 36 %.
In the process of DHE development in the WBC. The role of line ministries and national accreditation bodies is extremely important. DHE development is a much more complex process than an academic study program because it involves many stakeholders but the benefits for students, companies and society return in many ways. As an example, the Austrian Ministry of Education, Science and Research has set up the **following criteria for characterizing the dual degree programmes in Austria:**

- Repeated sequence of theoretical phases and internships with continuous reflection.
- Internships out beyond the normal scope of an internship in a technical college degree program, both in terms of time and in terms of the specification of the content.
- Acquisition of curricular defined competencies takes place at two places of learning and is characterized by the combination of science and focus on implementation.
- Admission process for college and company are in the responsibility of each partner and are coordinated.
- Company must take a training commitment which is suitable to convey the intended course content.
- Organization of the theoretical and practical phases, the conditions for an acceptable total time load (ECTS) for students.
- Relationship of the three partners(students, universities and companies)is subject to mandatory regulations for quality assurance.

In **Germany**, the outline of the **framework for German Dual Higher Education programmes** is as following:

- Applicants have to be generally eligible for HE admission.
- Involvement of companies in the recruitment process has to be documented and is part of the accreditation.

[8]At the VET level, a standardised employment contract has been defined by the state.

- Bachelor programmes last three years and offer 180 ECTS credit points: at least 120 ECTS credit points for theory and at least 30 ECTS credit points for practice.
- There is a clear relation between theory and practice (academic relevance of practice has to be proven).
- The programme includes a final thesis with 6-12 ECTS credit points.
- The overall annual working time of students (academic work load for work and study plus any additional work for the company) has to be "reasonable" (There is no mentioning of an actual limit but information from some institutions indicate an average of around 2.000 hours per year, which is clearly more than the typical full time employment).
- Each faculty has to meet criteria for regular Universities of Applied Sciences, e.g. at least 40 % of teaching has to be provided by employed professors. This is a precondition in order to guarantee institutional research activities and also creates options for profund and intensive student mentoring.
- The existence of a quality management system for the cooperation of the two different learning environments and of a well described mentoring and counseling system (during practise) for students has to be proven.

4. CONCLUSION AND RECOMMENDATIONS

Based on the inputs on study programmes in define EU programme countries and the analysis of the DHE framework in programme countries from the EU project ApprenticeshipQ, the following elements have been identified for consideration when developing future DHE models/programmes for West Balkan Coutries:

- Current legislation in the WBC countries **largely disables or does not recognize** the DHE and the first steps must be aimed at resolving the many legal elements that DHE brings with it,
- A student who attends DHE in the **first place is a student and he/she is involve in education in a practical environment** and only he is part time employees. This means that it does not cost the employer financially any more than his/her potential scholarship allocations. These variants must be resolved by legal regulations and it is therefore better not to enter the DHE process without clear solutions.
- DHE programmes need to consider the **Bologna requirement**s This is to enhance horizontal and vertical mobility as well as to simplify recognition of degrees. Furthermore, this promotes trust by employers. The programmes should also clearly indicate the relevant EQF level (6 – BA, 7 – MA).
- DHE graduates need to have **full access to the next educational level** (e.g. MA, PhD) both at applied and scientific (non-dual) HE programmes.
- As and where feasible it can also be considered to award a **VET degree** together with the BA.
- Dual legislation must specify the **content of contracts** signed by student-university-companies (eg Germany) or student-companies (eg Austria),
- In term of the dual approach chosen, it is recommended to opt for **curriculum integrated or work-based models** since these approaches provide best for a systematic integration of work experiences.
- **Relation theoretical and practical work**: It is recommended that on BA level, the first 2 semesters focus on theoretical work with first work-based experiences from semester 3 to 6 (for example, 80:20/theoretical vs practical work). As the experience in the application of DHE grows, it would be logical to increase the practical work compared to the theoretical one in the ratio of the recommended EU values (50:50%).

- At MA level, the focus should be on the practical experiences in R&Dand can be designed in different ways, depending on the fields of study and institutional framework. As a minimum, students should be required to carry out 60% of their study period with the IP doing practical work.
- **Mentors in companies** should receive training in order to get prepared for their highly responsible role. Regular meetings between company mentors and HEI teaching staff are recommended (at least once or twice a year). In general, obligations of companies and mentors should be openly discussed and clearly defined. This also includes questions such as the remuneration of mentors or the amount of time spent for mentoring.
- In terms of **curriculum developmentand revision**, we should consist of representatives both from HEIs and from industry (suggestion: 50:50). It is also recommended that IPs have at least 5 years of experience in their respective field/discipline.
- Both academic staff and IP partners should be involved in the **teaching process**. It is recommended that both should have industry experience, but teachers from IPs should have approximately 5 years of prior industry experience plus a relevant academic degree (at least MA).
  Assessment: The HEI should be primarily responsible for the assessment of students but should request inputs on students' performance from IPs in line with an established reporting and grading system.
- **Final thesis**: It is recommended for the final thesis to be co-mentored by HEI and IP representatives who were involved in the teaching process. The IPs should grade the applied part of the thesis while the university takes responsibility for the academic and theoretical part of the thesis. It is also recommended for the HEI mentor to visit the company before the student starts working on the thesis. Overall, it is considered very essential for HEI staff to get to know the respective companies, to meet mentors and to develop and maintain personal contacts.
- At the level of **Ministry** there should be a **clear catalogue of criteria** which outlines the requirements a study programme has to fulfil in order to be called "dual education in HE". Otherwise the definition of what is DHE might get lost instead of branded.

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LIST OF ABBREVIATIONS

BA	Bachelor
DHE	Dual higher education
ECTS	European Credit Transfer System
EQF	European Qualification Framework
EU	European Union
FH	Fachhochschule (in English: University of Applied Sciences)
HE	Higher education
HEI	Higher Education Institution
HVET	Higher Vocational Education and Training
IP	Industry partner
PhD	Doctor of Philosophy
UAS	University of Applied Science
VET	Vocational Education and Training