Training Guide

Módulo 2:
Train the Trainer

Implementación:

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in Saltillo, México

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Guide: How to adapt the Training activities to the industrial context. The case of Hochschule Düsseldorf

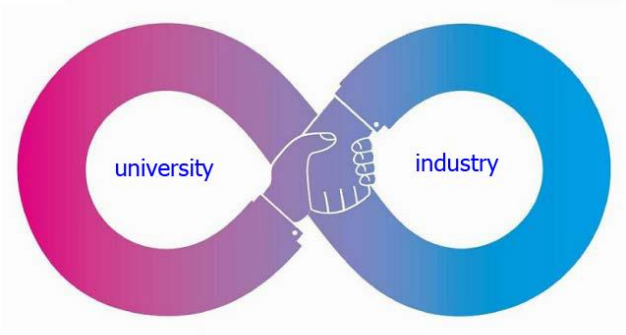


Figure 1: Cooperation University with Industry (http://www.step-tempus.net/content/university-industry-liaison-offices)

1. Idea

The Hochschule Düsseldorf (HSD) is a university of applied sciences, meaning that in comparison to a general university the university of applied sciences has a more practical approach and often also a closer relationship to the (regional) industry. Furthermore, all professors, teaching at a university of applied sciences, do need to have at least a 5years industrial working experience in their future research and teaching area. This all leads to the fact, that the education content often is tailored towards the industrial needs and due to the constant exchange updated regularly. The HSD has also the advantage of being located in the heart of Europe having a good infrastructural access to land, air and water and therefore also attracting national and international companies. Considering all this information as well as the focus of a university of applied sciences, the necessity of adopting the training activities to the industrial context is given.

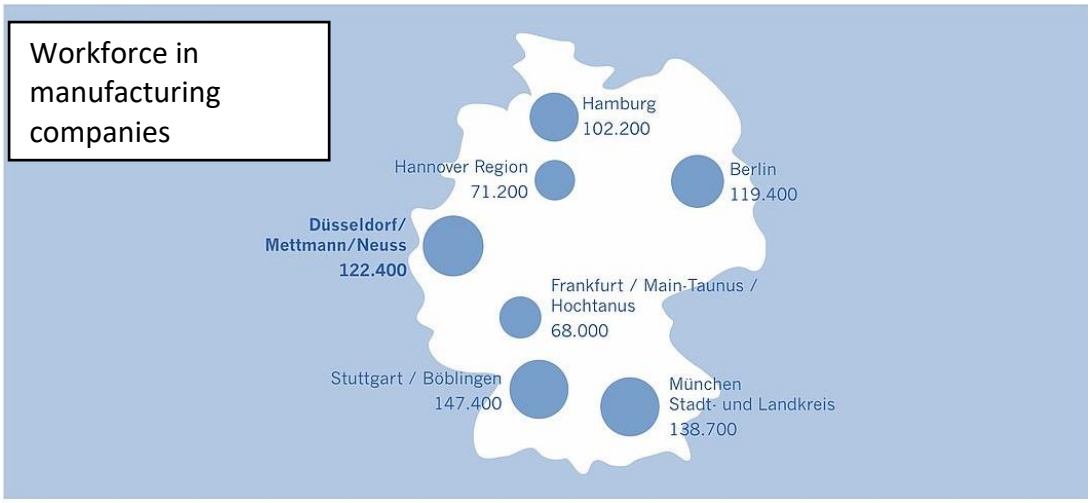


*Figure 2: : **Workforce Düsseldorf Area** (Arbeitskreis Erwerbstätigenrechnung nach Wirtschaftsbereichen 2013)*

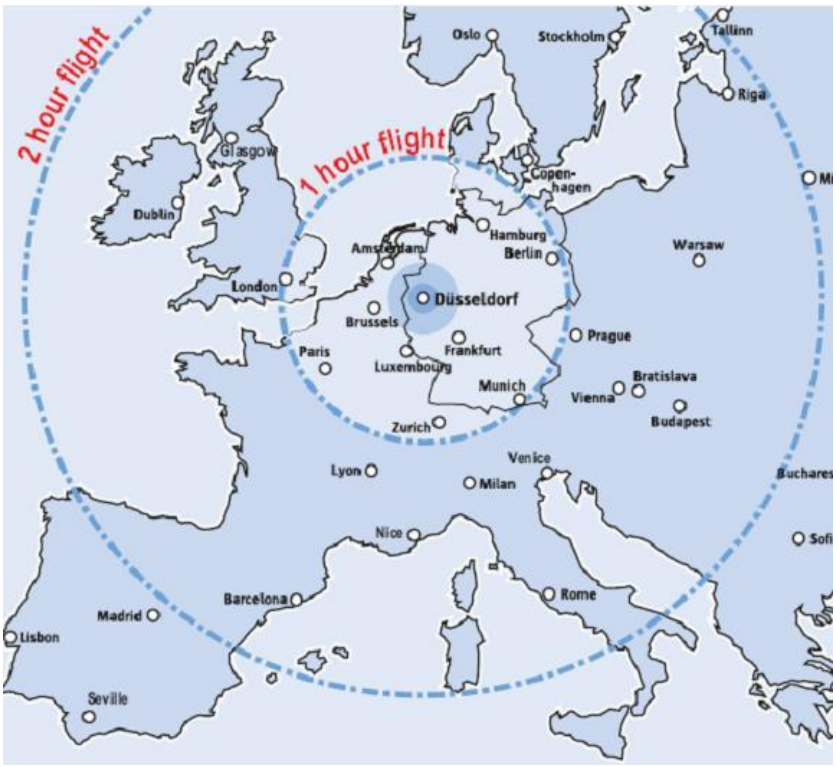


*Figure 3: **Location Düsseldorf** (hhttps://www.duesseldorf-tourismus.de/en/getting-here/)*

2. Preparation

Several actions have to be set in place in order to establish a constant involvement of the industrial needs when designing the study program and the curriculum. Every four to five years the study programs are accredited by a national agency, which is also checking the integration of industrial needs in the curriculum. Therefore, the HSD is driven to work on that matter constantly. Due to the fact that the professors working at the HSD must have an industrial background, they normally take this partner with them and integrate some practical examples from their past into their teaching program. Furthermore, often industrial partner asks to present their company during lessons. However, it should be noted, that the HSD is not a place, where companies can do some random advertisement for themselves, but do need to include some practical exercises/business cases, where general knowledge is trained. Apart from that, a certain procedure has to be established, in order to contact properly companies and to standardize the level of involvement. The cooperation between HSD and the industry takes place during teaching lessons, while working on research proposals and when organising (common)-events. In the next paragraph we will give an overview on how and when the HSD is cooperation with industry.

Sell your university by preparing information (Homepage, Flyer, Instagram posts etc.) where your current research and teaching topics are displayed in a suitable way. Pay some effort to and time for preparing this information. Make sure, that you point out what advantage the companies have when being involved. Reasons can be very general (see Chapter 4 Benefits) or specifically broken down to the companies and their work field.

3. Set Up a Transfer Center – Guidelines

Due to a lack of skilled employees and the necessary drive to come up with new products and innovative services in the engineering environment, companies are exploring new ways and ideas. Working with universities on a professional level, is one of them. This idea, when being executed efficiently, can not only beneficial to the companies but to the universities as well.

First Steps

Finding a suitable company/university is of course the first step when trying to set up a successful transfer center. As easy as it sounds, especially this first step can be challenging. Depending on who is addressing whom, a clear profile of what is needed e.g. what can be offered is of help. Only if the profile / expertise of the university and the company is matching, a useful output can be generated. There are several ways and possibilities to get in contact. Speaking from our own experience, companies contacted us during excursions and asked directly for a closer cooperation, e.g. offering money in order to receive skilled future employees. The reason for this lucky incident might be the current situation in Germany, where companies are desperately looking for qualified staff, especially but not only in the engineering sector. However, our university offers annual events where (regional-) companies are invited to join in and where current successful research projects are displayed. Apart from that, a successful approach to the companies stands and falls with the contact of the professors as well as their ability to address them.

To Do University:

Define a list with what knowledge/laboratory/staff etc. can be offered and what in exchange can be asked from the companies (money for PHD-positions, equipment etc.). Talk to your marketing/alumni/research & transfer department and ask for possible events to get in contact with the industry and their help to prepare marketing material.

The Excellence/Transfer Center – the framework

After having found a suitable partner, a framework, in which the cooperation etc. is defined, needs to be set up. This is another essential part of a long lasting and sustainable cooperation. The partners each, do have different goals and desired outcomes and in order to avoid misunderstandings, a contract has to be signed. The content of the contract goes from how much and what can be published or not to how many patents and marketable products have to be realised. Furthermore, the number of PHD-position payed from industry and the use of equipment etc. should be clarified in a contract as well. In our university we do have a department, which only takes care of how research can be transferred to industry. The team consist of lawyers as well as experts on patents and finance. They already do have some basic contracts and calculations ready, which can be used. However, they are also able to personalize that to future cooperation, when given a suitable amount of time.

To Do University

Get in contact with the legal department as well as other relevant departments of the university (procurement, human resources, marketing etc.) in order to establish a (contractual-) framework to guarantee a smooth cooperation with industry.

Maintenance & Quality Control

After a suitable company is found and a framework has been set up, it is time to think of ways to make this cooperation last and to achieve the agreed outcome/quality. To do so, regular meetings (2-4 times a year minimum) with the industrial partner have to take place. During the meetings the current status has to be discussed and if necessary, changes can be adopted. Often it is the case, that the industry expects something different than delivered by the university and to avoid a bad ending, a constant exchange of information/results is useful. A software for sharing the information, which often can be offered by the companies, can be a helpful tool. Depending on the university, further possibilities to measure the quality (questionnaires etc.)

do exist and can be used. In the case of our university, we do have questionnaires we occasionally use. However, the regular meetings and the evaluation of the achievements of the agreed work tasks (papers, patents etc.) is part of our regular quality maintenance.

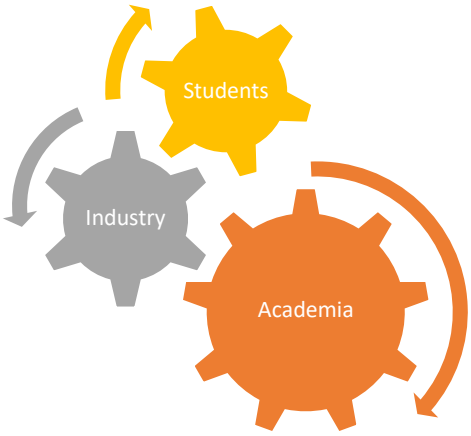
To Do University

Develop a timeline for the duration of the agreed cooperation time. Agree on and arrange regular meetings. If your university has a quality management system, evaluate, if you can use or adopt it. Talk to the company and ask if they have tools/software to exchange information and evaluate the quality.

Benefits

When both partners establish some ground rules at the beginning, keep an ongoing exchange of information/results and check the quality, a long lasting and sustainable relationship can be achieved. The benefits for the universities could be to receive a guaranteed funding for a certain amount of PHD-positions as well as free equipment. The companies could benefit from patents, marketable products and future well qualified staff.

4. Curriculum / Content



Generating a Win-Win-Situation for all participants

Erasmus+

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In the following, we will give you a first overview of the curricula of the subjects, where a high industrial involvement is achieved.

Workload	**Attendance**	**Self-study**	**Semester**
150 h	60 h	90 h	3rd
Lecturetype	**ECTS**	**Study progam**	
Practical 4 SWS	5	Industrial Engineering (Bachelor)	

Business Plan

Learning outcomes:
The students

- will be able to do a business-oriented group work course with methodical approach
- learn to work on a task within a team. In addition to obtaining information, this includes passing on knowledge to the other team members as well as structuring within a team.
- are able to independently analyze the information requirements for a topic
- are able to independently procure information on a topic and to transfer this competence to other problems
- are able to identify the relevance of different information and to analyze and merge it independently
- are able to present work results in a targeted manner to a committee

Content:

- Introduction to problem-based learning (PBL) methodology
- Conception and elaboration of a company-related problem in group work
- Weekly progress report / feedback date / discussion on the preparation of chapters
  of the business plan with the lecturer

Teaching method:

- Problem-based learning in group work

Exam:

- Final oral presentation and documentation

Procurement and supply chain management

Workload	Attendance	Self-study	Semester
120 h	45 h	75 h	4th
Lecturetype	**ECTS**	**Study progam**	
Lecture 2 SWS Exercise 1 SWS	4	Industrial Engineering (Bachelor)	

Learning outcomes:
The students

- know the most important fields of application of the logistics concept "SCM"
- know the tools of global procurement and supply chain
- can evaluate the state of given by industrial supply chain networks and assess and evaluate alternatives
- can develop logistical networks with the representation of the required information and goods flows (including return logistics) for the supply of customers with goods and services and put them together considering agreed service levels.

Content:

- Strategies and current developments in procurement and supply chain management
- Information and communication systems for procurement and monitoring of the supply chain
- Transport and Handling systems of the merchandise management
- Building Supply Chain Networks (Supply Chain Engineering)
- Information flows, goods flows, return logistics
- Procurement and supply chain management tools for:
  Inventory reduction, freight cost reduction, IT deployment, EDI Electronic Data Interchange, Web EDI, Barcode, RFID Radio Frequency Identification RFID, Data Warehouse Systems.

Teaching method:

- Lecture with case studies
- Exercises with case studies

Exam:

- Written exam (60 min)

Investment and efficiency management

Workload	Attendance	Self-study	Semester
150 h	60 h	90 h	3rd
Lecturetype Lecture 3 SWS Exercise 1 SWS	**ECTS** 5	**Study progam** Industrial Engineering (Bachelor)	

Learning outcomes:

The students

- know the application of static and dynamic investment calculation procedures
- can compare and rate the life cycle costs of investment decisions
- know the static and dynamic procedures regarding the applicability for assess different industrial issues.
- are able to apply the course content to current economic issues
- recognize that these methods are important decision-making tools in companies

Content:

- Fundamentals of investment accounting
- Dynamic procedures (NPV method, internal rate of return method, annuity method)
- Static procedures (cost comparison, profit comparison, amortization, profitability)
- Life cycle cost analyzes, break-even calculation,
- Current economic issues in the industrial environment

Teaching method:

- Lecture
- Exercises with case studies

Exam:

- Written exam (90 min)

Workload	Attendance	Self-study	Semester
180 h	60 h	120 h	1st
Lecturetype Lecture 2 SWS Exercise 1 SWS Practical 1 SWS	**ECTS** 6	**Study progam** Industrial Engineering (Master)	

Life cycle and service management

Learning outcomes:
The students

- understand the importance of global life cycle management for products and services
- know the methods of global service management in an international environment
- know instruments and international standards for the development and provision of services / services in the industrial environment
- are able to design a life cycle management system for products and services with a global focus
- know strategies for successful obsolescence management of global products
- know cultural peculiarities in the provision of services in selected foreign cultural areas
- can develop and use concepts and tools for service management

Content:

- Importance and Benefits of Life Cycle Services for multi-national industrial companies
- Analysis of the service portfolio in terms of business impact on industrial companies in an international context
- Obsolescence management of products and services
- Methods for the management and controlling of service provision
- The importance and development of Service Level Agreements throughout the Product Life Cycle
- The importance of services in Product Life Cycle Management

Teaching method:

- Lecture
- Exercises with case studies
- Practical creation and management of service delivery management tools

Exam:

- Team project presentation (30 min duration)

Workload	Attendance	Self-study	Semester
180 h	60 h	120 h	1st
Lecturetype Lecture 2 SWS Exercise 1 SWS Practical 1 SWS	**ECTS** 6	**Study progam** Industrial Engineering (Master)	

Methods for production optimization

Learning outcomes:

The students

- explain and evaluate the benefits of globally standardized production systems ("holistic production systems")
- evaluate and select selected, internationally used production optimization methods for their operational capability for optimizing production issues
- assess and select selected production optimization methods for their suitability for optimizing production issues
- know how to apply and implement selected methods independently in an industrial environment.
- conduct method training for your fellow students, thereby building competencies as a trainer and moderator of groups
- evaluate current strategies in production (opportunities and risks, organizational form) and propose and select targeted for factory output planning

Content:

- Structure and content of integrated production systems
- Approaches of lean management / lean production
- Technical & economic key figures in production
- Strategies in production
- Strategic and operational implementation of selected methods in the production environment, such as (SMED, Value Stream Design, Digital Logistics Planning OEE Anlaysen, Lean Office, 5S, Design Thinking, Six Sigma etc.)
- Establishment and practical implementation of training seminars
- Development and execution of training sessions on selected methods
- Recording and evaluation of production-relevant key figures

Teaching method:

- Problem-based learning (PBL) with group work

Exam:

- Team project presentation (30 min duration)

Computer-integrated project work

Workload	Attendance	Self-study	Semester
150 h	45 h	105 h	6th
Lecturetype Lecture 1 SWS Seminar 1 SWS Practical 1 SWS	**ECTS** 5	**Study progam** Industrial Engineering (Bachelor) Mechanical Engineering (Bachelor)	

Learning outcomes:
The students got to know all phases of product development and production as part of the engineering work-flow-concept (Computer supported) using computer-aided methods. They have team experience under project conditions.

Content:
As a project task, a team of at least 4 students receives the order for the representation of an operational process chain Development - Production.
They are creating essential documents that are required for production:

- CAD drawings
- Strength verification (FEM) for critical components,
- Production plans
- Bills of material and Costing (PPS)
- NC programs
- Programs for generating a prototype from the CAD data (Rapid Prototyping)
- complete presentation of the project process including project structure plan and work packages / processes (Engineering workflow software or project software)

Students are assigned roles to solve the task in the team:

- Developers
- Calculation Engineer
- Production planners
- Project Manager
- other roles to be defined by the students themselves

The result must be presented in a joint presentation.

Teaching method:

- Problem-based learning (PBL) with group work

Exam:

- Team project presentation (30 min duration)

Workload	Attendance	Self-study	Semester
			5th
Lecturetype	**ECTS** 30	**Study progam** Industrial Engineering (Bachelor) Mechanical Engineering (Bachelor) Process Engineering (Bachelor)	

		Energy and environmental Engineering (Bachelor)

Practical semester

Learning outcomes:
The students

- are introduced to the professional activity through the internship semester through engineering-related cooperation in companies or other institutions of the professional practice.
- can apply the knowledge and skills acquired in the previous study
- can make an appropriate choice of subjects in electives.
- have also gained practice in writing technical reports and discussing technical issues.

Content:
The practical semester is divided into three sections:

(1) Praeseminar:
Here are

- the organizational framework for the practical semester explained and an introduction to scientific work and the preparation of technical reports.

(2) Internship:
In addition to the practical work in the practice placement, a scientific report on selected parts of the internship is to be prepared during the practical semester (practical report).

- The content of the report is to be agreed with the supervisor on the part of the practice and the supervisor of the university, the mentor or the mentor. It should be striven that the report is also suitable for the host company.
- If the activity of the student precludes the possibility of writing a scientific paper on the topic, the mentor may determine another topic in consultation with the student.
- The practice report must be submitted to and approved by the practice office.
- The practice report is also to be submitted to the mentor for evaluation within two weeks after completion of the internship, unless otherwise agreed with the latter.

(3) Postseminar:

- As part of the post seminar, the students present their practical semester as part of a lecture. The evaluation of the presentation contributes 2/3 to the evaluation of the post seminar.
- The lecture must be submitted in electronic form to the internship semester at least one week before the post seminar.
- At the end of the post-seminar there will be a written examination of the contents previously heard. The result is included 1/3 in the rating of the post seminar.

Teaching method:

(1) Praeseminar: lecture or seminar
(2) Internship: Internship
(3) Postseminar: lecture and written exam

During the internship, the trainee is supervised by a mentor of the university.
The mentor can visit the student at the practice site and inform themselves about the intern's or intern's efforts.
If there are any doubts about the appropriate use of the student, the mentor must work to remedy the situation.

Exam:

(1) The evaluation of the practical semester takes place in half on the basis of the written preparation of the practical report by the mentor.
(2) The assessment of the practical semester is made in half by the evaluation in the post seminar (lecture and written exam). The written exam can be omitted.

The disregard of formal requirements such as deadlines or similar can be considered in the rating of the post seminar.

5. Benefits

In order to set up a long lasting relationship between universities and industry, a win-win situation, with benefits on all sites has to be established. In the following, the benefits for each party is listed.

a. Benefits Industry

- Future employees
- New business ideas
- Solution for problems
- Good PR and improve image (battle for the best)

b. Benefits Students

- Early contact to industry (finding future employer)

- Challenge: testing and applying know-how under real industrial circumstance
- Motivation booster
- Studying useful information (matters to industry)

c. Benefits University

- Good reputation among (future-)students
- Good reputation among industry
- Receiving funding

6. Outlook / Future Development

Students graduating from HSD are seen as future contacts from industry. Therefore, HSD is planning to establish a kind of CRM-system, where the student data is kept and used for further purposes, such as invitations for Christmas parties, invitations for participating during lessons and other events.

7. Questions / Discussion

At the end of the presentation we would like to present some questions to you in order to give you some ideas on how you can improve and motivate more companies to work with your university and get them involved into research and teaching.
Questions:

A) Current Activities with Industry / Industrial Involvement
B) Difficulties in working and involving industry
C) How to ensure sustainability and the quality of university-industry cooperations / transfer-center
D) Lesson learned – new Ideas for your university