

IMFUTURE: International Master's Degree for the FURniTURE Sector

Agreement Number: 2016-1-UK01-KA203-024438

I02: Trainig paths, learning content structure and guidelines for lecturers

Main Author:

Giovanni Tosi (COSMOB-Itly)

Contributing Authors:

Tomas Puebla Martinez (CETEM-Spain)

Giovanni Tosi (COSMOB-Itly)

Mike Dimont (BFM-UK)

Marcin Zbiec (WULS-Poland)

Ali Bakir (BNU-UK)

Lyndon Buck (BNU-UK)

Andrea Marconi (U Camerino-Italy)

Alberto Hoces-Garcia-University of Murcia

Content

1	The aim of the IMFUTURE project and the learning programme	3
2	Short description of IO2	4
3	Training paths development.....	5
3.1	<i>Target groups</i>	<i>7</i>
3.2	<i>Basic definition of target groups</i>	<i>7</i>
	<i>Manager.....</i>	<i>7</i>
4	Definition of learning content modules.....	8
5	Structure of the Mastre’s programme.....	9
6	Selection of the fundamental modules	9
7	Selection of the optional modules and subjects	10
8	Harmonisation and validation of the learning modules and training paths.....	11
9	Subjects framework	12
10	Development of the content.....	13
10.1	<i>Leaders and collaborators of the modules and subjects</i>	<i>13</i>
11	Moduels in the Master’s programme	14
12	Learning paths	16
13	Breaking down modules, subjects and Learnng Units	22
14	Guidelines for trainers.....	56
14.1	<i>Basic concepts utilised.....</i>	<i>56</i>
14.2	<i>Teaching strategies</i>	<i>66</i>
14.3	<i>Methods and tools for the delivery of the content through the IMFUTURE Platform</i>	<i>78</i>
15	Ensure open licenses OER for training materials	82
16	References	85

1 The aim of the IMFUTURE project and the learning programme

The aim of “IM-FUTURE” is to develop the content for an International Masters’ Degree in the furniture sector

This activity was focused on breaking down the learning pillars into smaller and more manageable training modules and units. The objective is that the granularity of the modules will be such that student and companies can meet all their needs, assuring that no unnecessary training is received.

Each partner has participated in this definition according to their expertise and best practice training (face to face, on-line, slides, video, etc.). The training modules are going to be organised according to analysis of priority order and local requirements. It is going to be reflected the results of the research and survey that it was done in IO1

In previous IO, the partnership has received feedback about the necessities from the industry by surveys and workshops in UK, Spain, Poland and Italy. Finally, it was received more than 300 professional contributions. Moreover, the partnership has studied the current educational offer in HE in furniture sector in 22 countries (Austria, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, Italy, Latvia, Lithuania, Malta, Netherland, Poland, Portugal, Ireland, Romania, Slovakia, Slovenia, Spain, Sweden, UK) and, also it was studied in those 22 countries the educational offer in VET in furniture sector.

That information has been used to design the structure of the Master, training paths and training modules and units. Obviously, it was need a restructuration of the contents when the structure of the Master and modules, subjects and units were fixed because they had duplicate content and it was not organized in a comprehensible and training way.

In this report, you can find the structure of the Master, their modules, subjects and units with an explanation of each one.

Finally, it is using some terminology that it is necessary to know to understand properly the structure of the Master:

- Master is the whole content that we will develop
- Training paths, the different possibilities inside the Master – 60 ECTS
- Modules, are made to regularize the contents of the Master and make its structure and Training paths easier to be understood. For example: “Furniture design history” and “Design” is a Module
- Subjects, for example “Quality control”. Subject is a branch of knowledge studied or taught. It will be referred to an important part of the contents of furniture sector. Inside a subject, the content will have a common structure. Each subject has a number of ECTS, depending the number of hours to acquire the required knowledge, skills and competences.
- Units, inside each subject, for example “Material properties, construction, product development including proto-types”. Each unit could have a "powerpoint"
- ECTS: European Credit Transfer and Accumulation System. It is a standard mean for comparing the volume of learning based on the outcomes and their associated workload. It is considered 25 hours per credit point (because we are considering an academic year of 1500 hours of total workload and

60 ECTS credit). Moreover, the ECTS is split in 40% of teaching content, 40% of student work and 20% of tutorship and exam, in conclusion, 10 hours of teaching content, 10 hours of student work and 5 hours of tutorship and exams.

2 Short description of IO2

This output has defined and analysed the most suitable training paths according to the target groups. They were designed in terms of the necessary areas of knowledge and the pedagogical methodologies optimized to fit the variety of job profiles and the industry, by providing a core training path, as well as training modules and their units in languages to address the specific needs of certain job profiles. It also contains guidelines to support trainers and lecturers. Furthermore, the strategy for protecting the training materials under open licenses was described.

The Master's programme was based on the concept of Learning Outcomes.

Learning outcomes: *Statements of what a learner knows, understands and is able to do on completion of a learning process defined in terms of knowledge, skills and competence.*

Developing of materials related key topics like: How to study and understand applied arts (historic and contemporary). How do artists and designers create artifacts (case studies and practitioners) Creating an art and design brief. What are the different ways of doing art based research. Understanding Art and Design research methods; literature, practice based outputs, designing research questions, studying art based approaches to investigation, evaluation methods, dissemination and impact.

The Masters to provide to the student to the enough knowledge of applied arts that will allow him to undertake aesthetic designs of several range of product like furniture. For that, this pillar is the base of the IMFUTURE training course.

This Masters allows to students to build skill sets and knowledge base that will give opportunity to have a full comprehension of the manufacturing process. In reality SMEs will not always have the full compliment of machinery or industrial manufacturing processes. It is therefore important that students have an appreciation of state of the art processes available to them through outsourcing. Graduates who find employment will be encouraged to complete CPD to maintain cutting edge knowledge of manufacturing possibilities which will contribute to the aim of the project to create products that are aesthetically pleasing and are not limited by archaic 'outdated' knowledge.

These modules aims to prepare students for the complete process of manufacturing considering conceptual design to manufacture of full scale products (furniture).

The Masters also aims to provide the student with all the regulation and standards related with the commercialization of the furniture products. It may supply defects on the final commercialization of aesthetic furniture. They should be taken into account before, during and after the design and production process. For that, is a supporting pillar of the manufacturing process pillar that will lead the enterprise to the success in terms of barriers of commercialisation.

The activities conducted within IO2 were:

IO2-A1-Training path definition

IO2-A2- Definition of learning content modules.

IO2-A3- Harmonization and validation of learning modules and training path.

3 Training paths development

Training (Learning) path (pathway) is normally described as the chosen route, taken by a learner through a range of (commonly) e-learning activities, which allows them to build knowledge progressively.

Training Path methodology uses a performance improvement approach to learning / training and defines a Training Path as the ideal sequence of learning activities that drives target users (participants) to reach proficiency in their knowledge / experience / job in the shortest possible time.

Creating a curriculum is one of the essential functions within an education or training system, as it constitutes the guideline for planning, conducting and assessing learning processes. Existing literature reveals that curriculum development can be approached from three different perspectives (Smith and Keating, 2003, p. 121):

The first perspective is to regard it as 'rational' or 'linear': i.e., it is a logical process that proceeds from objectives to the selection of learning experiences to the organisation of learning material to evaluation.

The second perspective sees curriculum development as a 'cyclical' model, where the whole learning process is a cycle that continually renews itself so that evaluation leads to the reformulation of objectives.

The third perspective shows an 'interactive' model that assumes curriculum development can commence at any stage and that feedback leads to constant change at any stage.

The two most commonly used methods for curriculum development – DACUM and functional analysis – can be rated and described as linear models. DACUM (an acronym to represent developing a curriculum) is a method to define systematically the tasks, jobs, competences and tools associated with a certain type of workplace. DACUM is an inductive approach that defines small units so that it is possible to gradually extend those units and apply them in a broad context.

Three assumptions are underlying DACUM: First, people who regularly perform certain activities can describe them in a realistic and precise manner. Second, an efficient means to analyse a job is to describe the tasks of a specialist precisely and completely. Third, every successfully completed task requires special knowledge, skills, equipment and behaviour, which can be identified implicitly through work and job analysis.

The job analysis that is required by DACUM includes several elements, such as the analysis of occupations, jobs, duties, tasks and single work steps. Additional issues such as workers' behaviour,

their general knowledge and skills, tools, equipment, supplies and materials, as well as future concerns, should be considered. Gonczi et al. (1990, p. 38) defined steps to be undertaken to set up and conduct a DACUM procedure:

1. First, it is necessary to choose an expert facilitator and select participants from various levels of the relevant occupation. Participants must have a profound knowledge of the occupation and it is important that different interests (e.g., educators, practitioners, unionists) are involved.
2. Second, a pre-DACUM session must be organised in order to explain the process of curriculum development. At the beginning of the session, the facilitator has to give a general introduction to and review of the occupational area. Then the main duties within the occupation must be outlined; associated tasks, sub tasks and required competences must be identified.

Additionally, the importance of each task, sub task and competence must be rated according to the frequency of its performance and its importance for a holistic work performance. The results must be structured and recorded for a final report, which is then disseminated to the relevant authorities.

The steps of a typical DACUM session are outlined below:

1. General introduction and orientation
2. Review of occupational area
3. Identification of the duties
4. Identification of tasks, sub-tasks and competences associated with each duty
5. Reviewing and refining the outcomes so far
6. Establishing importance of each task and /or competence by rating the frequency of performance, its degree of importance, etc.
7. Final structuring
8. Recording final results
9. Preparing final report.

Problems articulated regarding DACUM include the status quo of a job description being taken into account, and so methodical aspects, as well as assessment designs, are disregarded. To address this problem, a holistic approach to curriculum development is necessary. This determines not only learning targets in terms of competence standards, but also respective and appropriate assessment guidelines, as well as methodical support for teachers or instructors. However, it seems unrealistic to set-up appropriate procedures that generate elaborated curricula within a short period of time. Functional analysis is another method for curriculum development that is widely used in the UK in a variety of industries. Functional analysis is a deductive and target-oriented approach (Gonczi et al., 1990, p. 43).

In the analysis, the central task of an occupation is defined and complex functions are derived. Furthermore, basic sub-functions and simple tasks are derived from complex functions of the occupation. Therefore, functional analysis may be characterised as a process of disaggregating complex functions into smaller components, where functions are the defined outcome of a realised activity without describing the specific context of the activity. Functional analysis leads to small units and elements of competence that compose the design of a competence standard. One arising problem is that functions should be generally defined, although they are not necessarily suitable for all the different contexts. Another difficulty is that the complexity of work processes and occupations cannot be easily addressed simply by disaggregating complex functions into smaller units.

Although both functional analysis and DACUM are complex procedures that require sufficient expertise from practitioners, they depict the most commonly used methods for curriculum development in Competence-Based Education and Training. Other methods – such as expert interviews, questionnaires, and Delphi – could not be established as appropriate tools for curriculum development within Competence-Based Education and Training on a large scale.

3.1 Target groups

IMFUTURE consortium identified appropriate Target Groups (users/students/training participators) for the Master's curriculum, based on consortium partner's preliminary research and knowledge, discussion, identification and set up via project consortium regular communication and project meetings.

Tree (3.) Target oriented user groups were defined:

1. Managers
2. Post-graduate Students
3. Professionals

(technical engineers from various furniture sectors).

3.2 Basic definition of target groups

Manager is a person engaged in management. Management / Business managers are responsible for overseeing and supervising a company's activities and employees. Small businesses rely on the business manager to keep workers aligned with the goals of the company. Business managers report to top executives in a larger organization, but in a small company, the manager might either own the company or report directly to the owner.

Types of Business Managers Business managers oversee the day-to-day operations in large and small organizations. In a big company, managers typically oversee an individual department, such as marketing, sales or production. In a smaller company, the business manager might oversee

operations in all departments. Office managers oversee the work of clerical or support staff in the business.

A post-graduate student is someone who is enrolled in a degree-granting program (either undergraduate or graduate) at an institution of higher education and registered full-time or part-time according to the definition of his/her respective public academic education institution.

Professionals in the case of IMFUTURE are mostly engineering technicians / technical engineers working in various thematic sectors or industries that are some kind involved in the furniture sector.

An engineering technician / technical engineer, is primarily trained in the skills and techniques related to a specific branch of engineering, with a practical understanding and has general fundamental engineering concepts. He often assist engineers and technologists in projects and research and development.

Professionals solve technical problems. They build or set up equipment, conduct experiments, and collect data and calculate results. They might also help to make a model of new equipment. Some technicians / engineers works in quality control, where they check furniture products, do tests, and collect data. In furniture manufacturing, they help to design and develop products. They also find ways to produce things efficiently. There are multiple fields in this job such as; software design, repair, etc. They may also be people who produce technical drawings or engineering drawings.

4 Definition of learning content modules

This document presents a preliminary framework of an International Master's degree for the furniture sector, including modules, subjects, units, abstracts. Changes may be necessary because Master could evolve during the development of the contents. For that, the distribution of the Master in this document is considered as a Draft.

- Point 4, there are an explanation about the main structure of the Master with the number of modules, subjects and units
- Point 5 and Point 6, these points are focused in the selection of the modules and subjects according precious steps of the project
- Point 7 is focused in the structure of the subjects
- Point 8 is referring to the responsible and collaborators entities in the moment of develop the content
- In Point 9 could be found the modules which are composing the Master
- Point 10 is about the 5 possible learning paths
- Finally Point 11 is focused in each subject with their content, units and knowledge, skills and capacities you could acquire.

5 Structure of the Mastre's programme

The Master, after studying the different possibilities and the received sector recommendations in previous output, it was decided that the following structure is the one which could have the best results:

- 5 training paths: Production, Business, Design, Research and No specialization
- 4 Main modules (compulsory) and 6 optional modules (10 modules in total), and Practices and Dissertation
- 18 Subjects (including Practices and Dissertation inside)
- 84 ECTS in total for a Master of 60 ECTS (one year)

It was created a draft structure of the Master with the following steps: Main Modules + Optional Modules + Practices + Dissertation

Main Modules will have 21 ECTS, Practices 12 ECTS and Dissertation 9 ECTS. At Optional Modules the student has to select 18 ECTS

It will be created 6 different Optional Modules with the composition of 2 linked subjects. According to that Optional Modules, it will stablish the 5 different Learning Paths (Production, Business, Design, Research and No specialization)

Subjects of the Master were selected to add to the student curriculum the needed knowledges and skills has consensus according the survey and desk research that it was done in previous steps of this project.

6 Selection of the fundamental modules

The main modules were selected according the consensus of the sector with the obtained information in previous output.

It was selected 4 fundamental modules (or common to every students) which will be compulsory but no each one with have the same number of credits:

- Production engineering – technology, process & maintenance – 7,5 ECTS
- Production – scheduling and planning – 7,5 ECTS
- Innovation, product & process improvement systems – 3 ECTS
- Fundamentals of enabling technology applications – 3 ECTS

The 3 first modules were the most selected ones to be included in a Master Degree for the furniture sector at the survey and according the sector it has to be incorporated into the master (“Production engineering – technology, process & maintenance” with 98% of votes, “Innovation, product & process improvement systems” with 97% and “Production – scheduling and planning” with 96%). “Fundamentals of enabling technology applications” has a really strong support of 88% in the survey

but it is slight smaller than other subjects, but in spite of this, it is considered by the consortium as an important tool for achieving the development of a Master which is looking to the future.

These fundamental modules represent 21 ECTS (60 ECTS are the total)

7 Selection of the optional modules and subjects

It is needed, at least, 18 ECTS of Optional Modules which will free to be selected by the students in their curriculum among the optional subjects.

The possible subjects that it would be integrating the Optional Modules are the following:

- Operations, business, & process management – 3 ECTS
- Materials management – 3 ECTS
- Furniture design history – 3 ECTS
- Design – 3 ECTS
- Quality control – 3 ECTS
- Workplace, leadership & personal effectiveness competences – 3 ECTS
- Logistics, warehouse, distribution & supply chain management – 3 ECTS
- Sales and Marketing – 3 ECTS
- Furniture process – 3 ECTS
- Industrial Property Rights and Entrepreneurship – 3 ECTS

Moreover, in order to prepare the students to the furniture research field, it would be added two additional subjects:

- Information Search and Retrieval – 6 ECTS
- Investigation Methodology – 6 ECTS

Each one of the 10 first optional subjects have 3 ECTS but ISR and Investigation methodology have 6 ECTS. These subjects will constitute 6 different modules of 2 unbreakable subjects; in fact, the student has to select modules and not subjects.

The selection of subjects to be part in the Master were done according the results of desk research and surveys across Europe and mainly in UK, Spain, Poland and Italy. In fact “Materials management” (the name of this subject is changed to “Materials”) and “Quality control” were selected to be included in a Master Degree for the furniture sector by 95% of the sample, “Operations, business, & process management” was selected by 94%, “Fundamentals of making & finishing” (the name of this subject is changed to “Furniture Process” to be clearer and more attractive) and “Workplace, leadership & personal effectiveness competences” were selected by 92%, “Logistics, warehouse, distribution & supply chain management” was selected by 90%. With these 6 subjects (and the compulsory ones), it is included in the curriculum of the Master, any subject that the sector has concluded that it has to be included by beyond 90% of professionals. But this joint Master needs to be complemented by other subjects, to be completed, for that it is included a subject of

“Fundamentals of design and furniture design history” (selected by 87%), but the consortium thought that it will be really extensive in this way and it is better to be split in two different subjects: “Furniture Design History” and “Design”. It is necessary to add a subject about “Sales and Marketing”, in that case, it is included 2 subjects of the survey in 1 (“Marketing” was selected by 87% and “Sales” by 84%). Finally it is added “Industrial Property Rights and Entrepreneurship” which it is inside “Fundamentals of standards – regulatory and technical”, it was selected by 86%

According to this, it is added to the Master every important request of the furniture sector (beyond 87%), making it to be closest to the professionals of the sector and ensuring that the Master addresses the needs of furniture community, indeed, it is a strong potential to make sure the sustainability. Moreover, it has to take into account that they are involved 4 universities of different countries, 2 VET providers and business representatives.

Finally, it is added to the curriculum “Information Search and Retrieval” and “Investigation Methodology”, as important step to train professionals in Research and Development (R&D), which have a positive correlation with firm productivity. It is proved that new developments, materials, designs... is a crucial factor in the sector.

8 Harmonisation and validation of the learning modules and training paths.

Thus, there have been established one research and four professional Training Paths. Students will have the option, also, of not choosing one of them, so they would be *No Specialized*. All of them, nevertheless, will have to study four mandatory modules (21 ECTS): “Module 1 – Production engineering – technology, process & maintenance”, “Module 2 – Production – scheduling and planning”, “Module 3 – Innovation, product & process improvement systems” and “Module 4 – Fundamentals of enabling technology applications”.

Depending of their choice of the six remaining modules, they will acquire their specialization:

- For Production, students must perform modules 1, 2, 3, 4, 5, 7 and 9.
- For Design, students must perform modules 1, 2, 3, 4, 6, 7 and 9.
- For Business, students must perform modules 1, 2, 3, 4, 5, 8 and 9.
- For Research, students must perform modules 1, 2, 3, 4, 10, and choose one from 5, 6, 7 or 8 depending on their investigation thematic.

At this point, it is needed to highlight that modules 5, 6, 7, 8 and 9 are only differentiated by a number, so it would be appropriate to name them in order to make more understandable the contents structure.

In conclusion, results of O2A1 and O2A2 are well harmonized, divided and planed. Even so, until the redaction of this report it has been detected some minor overlapping of the content between subjects, so it has been transmitted to the institutions responsible of the developing of the

content of each subject. Most of them are between basic and specialization modules, so the different point of view grant that the students will acquire different competences based on the knowledges offered by the Master.

The entire content of this report has been discussed during Project Team Meeting 3, carried out in COSMOB (Pesaro) February 16th, 2018. Thus, it is considered that the learning modules and training paths are harmonized and validated.

9 Subjects framework

These subjects will have a similar framework to facilitate the study of the learners and their acquisition of knowledge and skills. Each subject will have, at least:

- Structure of different units inside each subject. Each unit will have an independent e-learning content to work in, learners could access to this content through e-learning platform which is developing in IO3
- Base support document with the development of the explanation of the subject. That document could be used by the student to achieve the required knowledge of this subject. The content will be ample and easy to understand without any extra support.
- Knowledge, skills and competences to be acquired or developed in the module
- Practical exercises in order that the learner could acquire skills or competences related to this subject and put into practice the achieved knowledge
- Assessment criteria of the subject with different suitable questions

Subjects and units will have different type of material according the necessities: videos, slides, bibliographic material, hands-on training sessions...

The content of the modules, subjects and units will be done in English, however the consortium will analyze the possibility of releasing some of the content in Spanish, Italian and Polish depending the necessities but the consortium agrees that it is a considered a language training for the learners to do the whole master in English. In this case, it will be possible for the students to learn professional terminology in English and it will be easier to improve their possibilities of working abroad. In spite of this, at least, the abstracts of each subject will be done in Polish, Italian and Spanish too.

10 Development of the content

Each unit will be carefully reviewed and improved to make ensure a smooth transition between the different units in order that the subject has an internal consistency and without any redundant or missing part.

The development of each subject will be assigned to a consortium partner according their expertise as leader, the rest of partners will contribute to those subjects but following the instructions of the Subject Leader.

10.1 Leaders and collaborators of the modules and subjects

	BUCKS	CETEM	UNICAM	COSMOB	UM	BFM	WULS
Production engineering – technology, process & maintenance (FM)	LEADER	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB
Production – scheduling and planning (FM)	COLLAB	LEADER	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB
Innovation, product & process improvement systems (FM)	COLLAB	LEADER	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB
Fundamentals of enabling technology applications (FM)	COLLAB	COLLAB	COLLAB	LEADER	COLLAB	COLLAB	COLLAB
Operations, business, & process management (OS)	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB	LEADER
Materials (OS)	COLLAB	COLLAB	COLLAB	LEADER	COLLAB	COLLAB	COLLAB
Furniture design history (OS)	LEADER	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB

Design (OS)	COLLAB	COLLAB	LEADER	COLLAB	COLLAB	COLLAB	COLLAB
Quality control (OS)	COLLAB	COLLAB	COLLAB	LEADER	COLLAB	COLLAB	COLLAB
Workplace, leadership & personal effectiveness competences (OS)	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB	LEADER
Logistics, warehouse, distribution & supply chain management (OS)	COLLAB	LEADER	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB
Sales and Marketing (OS)	LEADER	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB
Furniture process (OS)	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB	LEADER
Industrial Property Rights and Entrepreneurship (OS)	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB	COLLAB	LEADER
Information Search and Retrieval (OS)	COLLAB	COLLAB	COLLAB	COLLAB	LEADER	COLLAB	COLLAB
Investigation Methodology (OS)	COLLAB	COLLAB	COLLAB	COLLAB	LEADER	COLLAB	COLLAB

FM: Fundamental Modules

OS: Optional Subjects

COLLAB: Collaborator

11 Moduels in the Master's programme

Modules are made to regularize the contents of the Master and make its structure easier to be understood. The 4-compulsory subjects of the beginning will be a fundamental module by itself:

MODULE 1 (FM): Production engineering – technology, process & maintenance – 7,5 ECTS

MODULE 2 (FM): Production – scheduling and planning – 7,5 ECTS

MODULE 3 (FM): Innovation, product & process improvement systems – 3 ECTS

MODULE 4 (FM): Fundamentals of enabling technology applications – 3 ECTS

Fundamental Modules are forming the Main part of the Master; this compulsory part has 21 ECTS.

The rest of the subjects are Optional and they are part of possible selected Modules to follow the different learning paths. Specifically, it has been built 6 different Modules, with unbreakable subjects. The connection of the subjects in one module has been done according their similarities and joint content

MODULE 5 (OM): 6 ECTS

SUBJECT 1: Operations, business, & process management – 3 ECTS

SUBJECT 2: Quality control – 3 ECTS

MODULE 6 (OM): 6 ECTS

SUBJECT 1: Furniture design history – 3 ECTS

SUBJECT 2: Design – 3 ECTS

MODULE 7 (OM): 6 ECTS

SUBJECT 1: Materials – 3 ECTS

SUBJECT 2: Furniture process – 3 ECTS

MODULE 8 (OM): 6 ECTS

SUBJECT 1: Logistics, warehouse, distribution & supply chain management – 3 ECTS

SUBJECT 2: Sales and Marketing – 3 ECTS

Report: *Trainig path, learning content structure and guidelines for lecturers*

MODULE 9 (OM): 6 ECTS

SUBJECT 1: Workplace, leadership & personal effectiveness competences – 3 ECTS

SUBJECT 2: Industrial Property Rights and Entrepreneurship – 3 ECTS

MODULE 10 (OM): 12 ECTS

SUBJECT 1: Information Search and Retrieval – 6 ECTS

SUBJECT 2: Investigation Methodology – 6 ECTS

The learner has to select 18 ECTS of the OM (Optional Modules), in total Master has 42 ECTS of Optional Subjects.

Additionally, Master has two extra components in order of the needed 60 ECTS

PRACTICES – 12 ECTS

DISSERTATION – 9 ECTS

According to this, the learner has to follow the next structure to obtain the certification of this Masters' Degree in the furniture sector.

Master	ECTS
FUNDAMENTAL MODULES	21
OPTIONAL MODULES	18
PRACTICES	12
DISSERTATION	9

12 Learning paths

In accordance with the selected subjects, it has built different learning paths that the learner could chose to build their knowledge, skills and competences in the matters that they prefer according their necessities.

PRODUCTION SPECIALIZATION

In this specialization, besides of the main training, the student is receiving information closer to how the piece of furniture is produce; it is included the study of the production management process, the control of the quality in raw material, semi-finished and finished products, introduction of new technologies in the production, selection of appropriate materials and their properties, how to understand technical specifications, eco-sustainability in production process, tools and machinery. Finally, it is added other concepts as leadership skills, more connected to improve the employment relationship, and principles related with the protection of intellectual property and entrepreneurship.

MODULE 1 (FM): Production engineering – technology, process & maintenance – 7,5 ECTS

MODULE 2 (FM): Production – scheduling and planning – 7,5 ECTS

MODULE 3 (FM): Innovation, product & process improvement systems – 3 ECTS

MODULE 4 (FM): Fundamentals of enabling technology applications – 3 ECTS

MODULE 5 (OM): 6 ECTS

SUBJECT 1: Operations, business, & process management – 3 ECTS

SUBJECT 2: Quality control – 3 ECTS

MODULE 7 (OM): 6 ECTS

SUBJECT 1: Materials – 3 ECTS

SUBJECT 2: Furniture process – 3 ECTS

MODULE 9 (OM): 6 ECTS

SUBJECT 1: Workplace, leadership & personal effectiveness competences – 3 ECTS

SUBJECT 2: Industrial Property Rights and Entrepreneurship – 3 ECTS

PRACTICES – 12 ECTS

DISSERTATION – 9 ECTS

DESIGN SPECIALIZATION

In this specialization, besides of the main training, the student is receiving information closer to how it is thought a piece of furniture and how it is created the draft or model according to that idea; it is included the use of ICT in the development of design project, the application of creative strategies, the design history, the study of methods for the realization of virtual prototypes, also, selection of appropriate materials and their properties, how to understand technical specifications, eco-sustainability in the design process. Finally, it is added other concepts as leadership skills, more connected to improve the employment relationship, and principles related with the protection of intellectual property and entrepreneurship.

MODULE 1 (FM): Production engineering – technology, process & maintenance – 7,5 ECTS

MODULE 2 (FM): Production – scheduling and planning – 7,5 ECTS

MODULE 3 (FM): Innovation, product & process improvement systems – 3 ECTS

MODULE 4 (FM): Fundamentals of enabling technology applications – 3 ECTS

MODULE 6 (OM): 6 ECTS

SUBJECT 1: Furniture design history – 3 ECTS

SUBJECT 2: Design – 3 ECTS

MODULE 7 (OM): 6 ECTS

SUBJECT 1: Materials – 3 ECTS

SUBJECT 2: Furniture process – 3 ECTS

MODULE 9 (OM): 6 ECTS

SUBJECT 1: Workplace, leadership & personal effectiveness competences – 3 ECTS

SUBJECT 2: Industrial Property Rights and Entrepreneurship – 3 ECTS

PRACTICES – 12 ECTS

DISSERTATION – 9 ECTS

BUSINESS SPECIALIZATION

In this specialization, besides of the main training, the student is receiving information closer to manage the company, it is more connected to financial results of the organization, obviously it is included aspects of production and design in order to the better understanding of the whole process. Also, it is included the operations strategy, business management, the examination of the benefits, company management, control of the quality, storage and warehouse functions, make inventories, orders, implementation of a WMS, make a supply chain strategy, how to apply marketing tools. Finally, it is added other concepts as leadership skills, more connected to improve the employment relationship, and principles related with the protection of intellectual property and entrepreneurship.

MODULE 1 (FM): Production engineering – technology, process & maintenance – 7,5 ECTS

MODULE 2 (FM): Production – scheduling and planning – 7,5 ECTS

MODULE 3 (FM): Innovation, product & process improvement systems – 3 ECTS

MODULE 4 (FM): Fundamentals of enabling technology applications – 3 ECTS

MODULE 5 (OM): 6 ECTS

SUBJECT 1: Operations, business, & process management – 3 ECTS

SUBJECT 2: Quality control – 3 ECTS

MODULE 8 (OM): 6 ECTS

SUBJECT 1: Logistics, warehouse, distribution & supply chain management – 3 ECTS

SUBJECT 2: Sales and Marketing – 3 ECTS

MODULE 9 (OM): 6 ECTS

SUBJECT 1: Workplace, leadership & personal effectiveness competences – 3 ECTS

SUBJECT 2: Industrial Property Rights and Entrepreneurship – 3 ECTS

PRACTICES – 12 ECTS

DISSERTATION – 9 ECTS

RESEARCH SPECIALIZATION

In this specialization, besides of the main training, the student is receiving information closer to the investigation in the furniture field. It is proved that new developments, materials, design... are crucial factors in the sector. It is necessary to reinforce the connection between science and furniture sector. It is included how to seek information, how to establish objective in the search of information, the scientific method, development of an investigation, how to share the results. Moreover, it will be added aspects of other learning paths, focused in the interests of the student about their future specialization inside the furniture field.

MODULE 1 (FM): Production engineering – technology, process & maintenance – 7,5 ECTS

MODULE 2 (FM): Production – scheduling and planning – 7,5 ECTS

MODULE 3 (FM): Innovation, product & process improvement systems – 3 ECTS

MODULE 4 (FM): Fundamentals of enabling technology applications – 3 ECTS

MODULE 10 (OM): 12 ECTS

SUBJECT 1: Information Search and Retrieval – 6 ECTS

SUBJECT 2: Investigation Methodology – 6 ECTS

MODULE 5, 6, 7, 8 or 9 (OM): 6 ECTS

SUBJECT 1: – 3 ECTS

SUBJECT 2: – 3 ECTS

PRACTICES – 12 ECTS

DISSERTATION – 9 ECTS

NO SPECIALIZATION

The students could select the modules that they think more useful for their future integration into the workforce of the sector. In this case, they are learning about different areas according their personal interests.

MODULE 1 (FM): Production engineering – technology, process & maintenance – 7,5 ECTS

MODULE 2 (FM): Production – scheduling and planning – 7,5 ECTS

MODULE 3 (FM): Innovation, product & process improvement systems – 3 ECTS

MODULE 4 (FM): Fundamentals of enabling technology applications – 3 ECTS

MODULE 4, 5, 6, 7, 8 or 9 (OM): 6 ECTS

SUBJECT 1: – 3 ECTS

SUBJECT 2: – 3 ECTS

MODULE 4, 5, 6, 7, 8 or 9 (OM): 6 ECTS

SUBJECT 1: – 3 ECTS

SUBJECT 2: – 3 ECTS

MODULE 4, 5, 6, 7, 8 or 9 (OM): 6 ECTS

SUBJECT 1: – 3 ECTS

SUBJECT 2: – 3 ECTS

PRACTICES – 12 ECTS

DISSERTATION – 9 ECTS

13 Breaking down modules, subjects and Learning Units

MODULE 1 (FM): Production engineering – technology, process & maintenance – 7,5 ECTS

LEADER TO DEVELOP CONTENTS: BUCKINGHAMSHIRE NEW UNIVERSITY

Engineering: Production technology, process & maintenance module is exploring Engineering: origins, methods, context. It explores some key principles of engineering, while helping students to improve their study skills and develop as an independent learner. Scientific and mathematical skills are both essential tools for engineering. They form a major part of this module and are included and practised throughout, with the engineering topics providing a clear context for their application. Engineering is all about innovation, engineers are also required to work to many standards, and health and safety are essential considerations. This module examines examples of standards and be introduced to some key principles of production technology and process. Module explore how the materials used in manufacturing products are obtained and transformed, from extraction from natural resources through to final use.

Also, this module includes aspects of engineering analysis, design and modelling methods, and uses appropriate mathematical software for each. Analytical, communication and learning skills necessary for all engineering disciplines are developed in a context that provides grounding for higher-level, more specialized study.

UNITS

- ***UNIT 1: Material properties, construction, product development including proto-types***
- ***UNIT 2: Production technology, production optimization***
- ***UNIT 3: Production organisation and business administration***
- ***UNIT 4: Mechanical engineering and automation***
- ***UNIT 5: Maintenance management and tracking programs***
- ***UNIT 6: Eco-sustainability including ‘design-for-life’***

MODULE/SUBJECT: PRODUCTION ENGINEERING – TECHNOLOGY, PROCESS & MAINTENANCE		
Knowledge	Skill	Competence
<ul style="list-style-type: none">• Explain why it is important to design interactive products that are usable.	<ul style="list-style-type: none">• Management of learning and ability to reflect on development	<ul style="list-style-type: none">• Carry out research and apply creative strategies for

<ul style="list-style-type: none"> • Define key terms used in engineering design. • Explain key theories used in the design of engineering products. • Describe different techniques for involving users in the design of engineering products. • Explain the importance of iteration, evaluation and prototyping in engineering design. • Discuss theoretical or empirical evidence supporting a list of engineering design principles. • Discuss accessibility issues for engineering products. 	<p>as an independent learner.</p> <ul style="list-style-type: none"> • The ability to use specialist knowledge to solve problems creatively • Effective communication skills • Project management skills • The ability to turn concepts into reality • Evaluate an interactive product using suitable techniques. • Perform data gathering in the context of developing a simple engineering product using suitable techniques • Communicate effectively to peers and specialists about requirements, design, and evaluation activities relating to engineering products. 	<p>generating design ideas</p> <ul style="list-style-type: none"> • Conceptualise and develop design ideas through drawing and modelling • Carry out critical observations on the factors that influence the creation of designs around you
---	--	---

MODULE 2 (FM): Production – scheduling and planning – 7,5 ECTS

LEADER TO DEVELOP CONTENTS: CENTRO TECNOLÓGICO DEL MUEBLE Y LA MADERA DE LA REGIÓN DE MURCIA

The Production-Scheduling and Planning module is a basic material for the management and direction activities in companies that work in the furniture sector, and therefore its knowledge is fundamental for the training of the students that take this course.

The main objective of the subject is to transmit the knowledge of the production area, which is the heart of the company, and that if it can be handled properly; it can achieve great competitive advantages.

The Production Scheduling and Planning module aims to be a subject that shows the main types of Production Programming problems at an operational level both for a long time horizon (year or year and a half), and for a relatively short time (weeks or days) and that gives the student tools and capabilities to solve them.

The module has a theoretical and practical approach since, on the one hand is intended that students understand the complexity of the problems to solve it and difficulties to address it and on the other you are offered tools, both academic and originating in the business reality, to obtain solutions to them.

At the end of the course the student must have achieved two generic objectives of similar relevance:

- Recognize the basic problems of production programming, understood the way in which resources are assigned and programmed in the different departments that have a close relationship with the production systems and operations of the company.
- Know how to use different tools for each scenario that allow to obtain maximum efficiency and effectiveness and to solve them in a satisfactory way.

Through this module we present a modern overview on the proper management of the functioning of the Productive System of a company in the furniture sector and its coordination with customers (demand, orders) through different approaches, which will help to achieve and preserve a competitive advantage for the company.

Demand forecasting with statistical methods (moving averages, exponential smoothing, regression, etc.), the planning of both aggregate and master production, material requirements planning systems and capacity management will be addressed.

After completing this course, students must achieve an understanding of the essential concepts of production planning in the field of the company in the furniture sector and related organizations.

The student will be able to identify the different problems that arise in the production department of a company in the furniture sector and will have a sufficient knowledge base to apply the different tools that are provided to solve them.

They will have the capacity to make decisions on key aspects such as the process, process time, industrial capacity and workforce that must be developed in the normal course of a company in the sector.

They must be able to apply the basic knowledge of the profession and relate them to production management, fostering the development of generic skills and competencies such as teamwork, problem solving and decision making.

UNITS

- ***UNIT 1: Demand management and forecasting***

Specific statistics for forecasting demand through objective methods:

TEMPORAL SERIES

- Smoothing
 - Moving averages
 - Exponential Smoothing
- Of Decomposition
 - Brow, Holt, Winters
 - Classic Multiplicative
 - Box Jenkins Univariate

ASSOCIATIONS

- Regression
- Box Jenkins No Univariate

- ***UNIT 2: Scheduling techniques and control***

Explain existing types of production planning:

- With forecast of the demand: Aggregate Planning, Master Production Plan, Material Requirement Plan...
- No demand forecast: Just in Time System...

- ***UNIT 3: Aggregate Planning (AP)***

Aggregate Planning: Aggregate planning addresses labor force determination, production quantity, inventory levels, and external capacity, to meet the requirements for a medium-term planning horizon (6 to 18 months).

- ***UNIT 4: Master Planning (MPS)***

MPS is an operative decision regarding the articles and quantities that must be manufactured in the next planning period. Their characteristics are:

- Determine what should be done and when
- It is established in terms of specific products and not in families
- It is a decision of what is going to take place, not a more prognosis

- ***UNIT 5: Capacity Resource Planning (CRP)***

In this subject we are going to study the planning of resources, both machine and man, necessary to realize in a set time a whole series of works assigned to a productive center.

- ***UNIT 6: Material requirements planning (MRP)***

In this subject we are going to study a production planning, scheduling, and inventory control system used to manage manufacturing processes.

- ***UNIT 7: Risk management. Theory of Constraints (TOC)***

In this subject we are going to study a theory that tries to reduce or eliminate the bottlenecks of the productive system.

- **UNIT 8: Improvement of Plant Layout**

In this subject we are going to study a theory and technique to improve the productivity of the company by improving the distribution of the production plant.

MODULE/SUBJECT: PRODUCTION- SCHEDULING AND PLANNING		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> • Specific statistics for forecasting demand through objective methods. • Knowledge about existing types of production planning with the demand forecast (Aggregate Planning, Master Production Plan, Material Requirement Plan ...) and no demand forecast (Just in Time system). Knowledge to use and implement the aggregate Production Plan. • Knowledge about the operation, advantages and disadvantages and implementation of production Scheduling and Planning systems such as: Production Aggregate Plan, Production Master Plan, Materials Requirement Planning and Capacity Requirements Planning. • Knowledge basic about theory of constraints and improvement of layout of industrial plants. 	<ul style="list-style-type: none"> • Performing a forecasting demand of a specific product used to do it a historical database. • Ability to distinguish different production system depending on the demand and temporal horizon. • Adapt and create different production planning systems such as: Production Aggregate Plan, Production Master Plan, Materials Requirement Planning and Capacity Requirements Planning. • Analyze and identify improvements in the field of the theory of constraints and layout of production plants. 	<ul style="list-style-type: none"> • Develop different forecasting of the demand for different products in the furniture sector using historical sales. • Implement different production planning system in a company of the furniture sector such as: Production Aggregate Plan, Production Master Plan, Materials Requirement Planning and Capacity Requirements Planning. • Manage and optimize the different resources of a company to meet the sales deadline of the production of any product in the furniture sector. • Implement and execute improvement plans related to the theory of restrictions and the layout of the production plant in the furniture sector.

MODULE 3 (FM): Innovation, product & process improvement systems – 3 ECTS

LEADER TO DEVELOP CONTENTS: CENTRO ECNOLÓGICO DEL MUEBLE Y LA MADERA DE LA REGIÓN DE MURCIA

In a globalized environment like the current one, in which the importance of information and knowledge inside the organization is increasingly important, managing them efficiently can be the greatest of our competitive advantages.

This growing complexity of the business environment is forcing both commercial and scientific organizations, private and public, to have suitable information management systems according their information needs environment. However, organizations are affected by their ability to manage and take advantage of both information and strategic knowledge, so it is vital to identify what they really need, know it, catch it, analyze it, and disseminate and prioritize correctly in the organization, in order to guide, in a proper way, the policy-making and detect new business opportunities.

Technological surveillance is, therefore, an essential tool for detecting opportunities about technological innovation and new ideas to facilitate the introduction of improvements in the processes, products and / or organization services.

Technological surveillance is a systematic business practice, oriented to the search and to the analysis of scientific and technological information, that information about the environment could be useful in the moment of taking certain decisions, and increasing the chances of anticipating possible changes and improving the business.

It is an indispensable practice that is often perform without being totally aware of it, and, therefore, it is made in an unstructured way, for that, learning to manage it is crucial for the s organization strategy.

The general objectives of the Technological Surveillance module are based on:

- Define Surveillance in general and Technological Surveillance and Competitive Intelligence according to the UNE EN 166000 standard.
- Know about typologies of modern sources of information: patents, databases.
- Knowledge about the data and text mining, and its role in the Surveillance / Intelligence process. – Awareness of the applications of the Surveillance / Intelligence from real cases and studies developed in several industrial sectors.
- Define and characterize the function of intelligence in the company.

- Know about the usefulness of Technological Surveillance Systems and Competitive Intelligence as an essential aspect for continuous innovation.
- Develop specific competences on the main components of the process of acquiring and processing information about the competitive environment of the company.
- Use the basic and advanced techniques that allow defining and anticipating the events of the competitive environment, critical for the success of the company.
- Learn the method to respond correctly to strategic, business and operational intelligence requests from decision makers.
- Use the methodology for its implementation in an organization.

At the end of the Technological Surveillance module, the student should be able to:

Apply the methodology and tools -basic and advanced techniques for the identification, systematic collection and analysis of critical information of the environment- of the Surveillance and Competitive Intelligence in order to achieve the development and innovation of existing products or processes, for the diversification towards new products or markets and for making strategic business decisions.

UNITS

- **UNIT 1: Technological surveillance & information management**

- Introduction to technological surveillance
- Design of a technological surveillance system
- Software Surveillance Technology

- **UNIT 2: Innovation management & systems**

MODULE/SUBJECT: INNOVATION, PRODUCT & PROCESS IMPROVEMENT SYSTEMS		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> • Basic computer knowledge (word processors, databases, etc.): user level. • Use consulting techniques • Statistical analysis system software. 	<ul style="list-style-type: none"> • Advise on efficiency improvements • Align efforts towards business development • Analyse the context of an organisation • Create a work atmosphere of 	<ul style="list-style-type: none"> • Planification and organization. • Learning and use of knowledge. • Analytical thinking • Initiative. • Achievement orientation.

<ul style="list-style-type: none"> • Data mining • Data models 	<p>continuous improvement</p> <ul style="list-style-type: none"> • Develop company strategies • Gather technical information • Interpret business information • Use consulting techniques • Perform data analysis • Provide improvement strategies 	<ul style="list-style-type: none"> • Strategic orientation.
--	--	--

MODULE 4 (FM): Fundamentals of enabling technology applications – 3 ECTS

LEADER TO DEVELOP CONTENTS: CONSORZIO DEL MOBILE SCPA

The goal of a higher industrial automation, integrating new production technologies to improve working conditions and to increase productivity and quality of the plants, is summed up with the term Industry 4.0. This latter applies to a set of rapid transformations in design, operation and service in the area of manufacturing systems and products. Designation 4.0 indicates that it is the fourth world industrial revolution, the successor to the three previous industrial revolutions that brought about great advances in productivity and changed the lives of people around the world. More in detail, the objective is the complete transformation in few years of the entire spectrum of industrial production, through the fusion of digital technology and the Internet with the conventional industry. In short time, everything in or around manufacturing operations (suppliers, plant, distributors, even production itself) will be digitally connected, offering a value chain with a high level of integration. The concept of a new industrial revolution originated in Europe, but it overlaps extensively all over the world each time we speak about smart factories, the Internet of industrial goods, smart industry, advanced manufacturing and so on. Industry 4.0 depends on a series of new and innovative technological developments:

- The application of information and communication technologies (ICT) to digitize information and integrate systems at all stages of product creation and use (including logistics and procurement)
- Physical Cyber-Systems that use ICT to monitor and control physical processes and systems

- Network communications involving wireless and Internet technologies that serve to link machines, labour products, systems and people, both within the manufacturing plant and with suppliers and distributors
- Simulation, modelling and virtualization of product design and installation of production processes
- Collection of large amounts of data, and their analysis and exploitation, either immediately on the ground or through analysis of big data and cloud computing
- Broader ICT-based support for workers, including robots, augmented reality and intelligent tools

The transformations planned for the coming years will bring about changes in different areas ad several issues will be faced such as high costs for SMEs, big data management, web security, property rights and new professional skills: about this latter issue, Employers will need personnel with creativity and decision-making

Expertise, as well as technical and ICT competences. By 2020, labour markets in the EU could need as much as 825.000 ICT professionals; this shortage may be even more pronounced in advanced manufacturing settings where big data analysts and cybersecurity experts are required.

UNITS

- **UNIT 1: Materials requirements planning systems**
- **UNIT 2: Manufacturing resource planning systems**
- **UNIT 3: Sales Order Processing systems**
- **UNIT 4: 3-D visualization**
- **UNIT 5: 3-D printing (proto types)**
- **UNIT 6: Computer aided design (CAD)**
- **UNIT 7: Computer Aided Manufacture including cutting optimisation systems**
- **UNIT 8: Enterprise Resource Planning**
- **UNIT 9: Production Management Information Systems**
- **UNIT 10: Inventory Control Systems**

- **UNIT 11: Warehousing and Distribution Systems**
- **UNIT 12: Integrated Manufacturing and Distribution Systems**
- **UNIT 13: Customer relationship management systems**
- **UNIT 14: Integrated Accounting Systems**
- **UNIT 15: Internet of things**

MODULE/SUBJECT: FUNDAMENTALS OF ENABLING TECHNOLOGY APPLICATIONS		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> • Big data • ICT • Domatics • Digital prototyping 	<ul style="list-style-type: none"> • Basic knowledge of functioning of digital manufacturing technologies • Identification of best enabling technologies to be integrated in furniture (sensors, automation) • Identification of best technological application for new business models 	<ul style="list-style-type: none"> • Technical (IT, engineering) • Statistical

MODULE 5 (OM): 6 ECTS

SUBJECT 1: Operations, business, & process management – 3 ECTS

SUBJECT 2: Quality control – 3 ECTS

LEADER TO DEVELOP CONTENTS:

SUBJECT 1: SZKOLA GLOWNA GOSPODARSTWA WIEJSKIEGO – WULS

SUBJECT 2: CONSORZIO DEL MOBILE – COSMOB

SUBJECT 1: Operations, business, & process management – 3 ECTS

Subject is a combination of engineering knowledge in the field of furniture production and modern forms of business management. The aim of the subject is to explain basic assumptions of production & business management and draw attention to the progress and evolution of production processes at all levels of the organization.

UNITS

- **UNIT 1: Operations strategy**

History of operations management. Development of operations strategies.

- **UNIT 2: Business Management**

Categorization of business management into design, modeling, execution, monitoring, and optimization. Re-engineering of businesses

- **UNIT 3: Manufacturing & finishing process environments**

Main types of manufacturing. Specific environment of furniture production. Design - product development – manufacturing – post-launch improvements.

- **UNIT 4: Standards (time measurement)**

Basics of time standardization, and application to workforce planning, line load balancing, MRP, wages, cost etc.

- **UNIT 5: Lean management**

Basics of lean management – lean production, maximizing value and minimizing waste. Types of waste. Demand-based flow manufacturing. Essential lean concepts and tools

- **UNIT 6: Process improvement**

Lean and six sigma process improvements method. Basics of statistics. Value mapping in process. Kaizen, Process mapping, 5S, Six sigma basics

- **UNIT 7: General sustainability**

Creation of business & manufacturing processes with caution to environmental effects. Conservation of energy & resources. Basics of environment protection. Sustainability goals. Sustainability as economic opportunity. Case studies of sustainable manufacturing.

- **UNIT 8: Total quality management**

Concept of Total Quality management. Basics of long term success as dependent on customer satisfaction. Deming's principles and diseases. Zero defect.

- **UNIT 9: Recycling opportunities**

Basics of recycling for the furniture and woodworking industry. Business possibilities.

SUBJECT: OPERATIONS, BUSINESS, & PROCESS MANAGEMENT		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> Defining the environment of the enterprise and examining the benefits this environment provides. Identify new technologies Understanding the nature of environmental protection Knowledge of sources and disposal methods of waste. 	<ul style="list-style-type: none"> Ability to use all sources of information for the best analysis of the situation of the company's favourable solutions. Implementation of new technologies and methods into furniture industry. Assessment of the impact of the company's activities on the external environment 	<ul style="list-style-type: none"> Ability to manage company in accordance to current standards, improvement of the processes utilizing most of the lean production&managem nt rules, with the rational use of natural resources.

SUBJECT 2: Quality control – 3 ECTS

Generally the consumer who wants to buy a new product gets information by sellers, advertisements and people. In parallel, information concerns aesthetical features (shape and colour) and prices. On the other hand, the consumer does not know if a product is dangerous for health, its weight resistance, if there is an associated risk for children, the response to safety tests; moreover, the technical fiche related to a specific product is not so easy to be understood. For these reasons, the European Union, for 30 years, has been defining a project of economic politics with the aim to increase the level of trust between consumers and producers and in order to have a progressively higher quality level of products. The necessary subjects for the realization of this project are: regulatory boards, testing laboratory and institutions for system and product certification. The regulatory boards for the issue of the Technical Standards in national and international spheres are recognized by the public authorities and charged with the aim of ensuring the participation of all stakeholders: producers, traders, consumers, research institutes, governments, etc. For each reference context, there is a specific of technical standards (World: ISO; European EN; Italy: UNI; France: ANFOR; Germany: DIN; UK: BS; U.S.A.: ANSI / BIFMA) The importance of technical standards is related to identify, define and uniform the measurement criteria of technical features of products. Technical Standards is therefore a common language made

available to technical and commercial operators in order to facilitate the free movement of products with defined and agreed characteristics.

It should be borne in mind and emphasized that the technical standards, national or international, are not a law; their legal force takes over when they are included as a clause in a supply contract or when national legislator organs turn them into laws, decrees and regulations of the state.

About quality control, the testing laboratory is generally an internal or external supporting structure, strictly connected with the company: each phase of the internal process such as design and manufacturing, in fact, can be related to a specific activity carried out by the laboratory.

This latter, operates to ensure the quality of manufacturing processes and finished products according to the technical standards. In this regard, in 2001 a European directive on general product safety was published; from that point, the subsequent legislative decrees on different issues (emissions of toxic substances, safety of workers, children and students, etc.) strengthen the bond with the technical rules, in order to increase the benefits both for producers and for consumers. A product, in fact, can be considered as safe when it complies with national and sectorial laws, as well as technical European standards; in case this latter are missing, the main reference are the national standards in force within the country where a product is commercialized.

UNITS

- **UNIT 1: Principles of Total quality management (TQM) – customer – supplier interface**

- **UNIT 2: Quality improvement tools - six sigma/ flowcharts/ Pareto charts/cause-and-effect diagrams/control charts/check sheets/scatter diagrams/histograms**

- **UNIT 3: Continuous improvement**

- **UNIT 4: Statistical techniques**

- **UNIT 5: Standards registration**

SUBJECT: QUALITY CONTROL		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> • Design fundamentals. • Features of raw materials, semi-finished and finished products • Manufacturing process 	<ul style="list-style-type: none"> • Development of a master plan of technical standards for quality and safety of products • Identification of technical requirements 	<ul style="list-style-type: none"> • Technical (chemical, physical, environmental) • Regulatory

	for specific materials, products and processes	
	• Definition of best practices to be implemented for quality products and processes	

MODULE 6 (OM): 6 ECTS

SUBJECT 1: Furniture design history – 3 ECTS

SUBJECT 2: Design – 3 ECTS

LEADER TO DEVELOP CONTENTS:

SUBJECT 1: BUCKINGHAMSHIRE NEW UNIVERSITY

SUBJECT 2: UNIVERSITA DEGLI STUDI DI CAMERINO – UNICAM

SUBJECT 1: Furniture design history – 3 ECTS

Exploring designs and designing sets the scene for the whole module. It looks at the relationship between people and products and discusses the human, cultural and engineering factors that influence the creation of designs. Creative design looks at the creative strategies that designers employ in order to address design problems, particularly strategies for idea generation in the early concept design phases. It also teaches some of the core theories of creativity. Embodying designs looks at the details of designs, the geometry and function of the parts that make up designs, the configuration of these parts and their impact on the overall form and function of a design.

In this module students will develop essential design skills and the knowledge that you need in order to identify and solve problems through design. Students will learn how to recognize needs and opportunities for design, how to generate ideas but also how to turn your ideas into detailed solutions.

UNITS

- **UNIT 1: Materials & making - themes in design history**
- **UNIT 2: History of furniture design**

SUBJECT: FURNITURE DESIGN HISTORY		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> • The factors that drive the development of designs. • The design process and the issues that arise in the progression from conceptual to detailed design • Research methods and strategies for creativity used in design 	<ul style="list-style-type: none"> • Make models to develop and communicate design ideas • Apply knowledge of research methods and creative strategies used in design • Respond to critical comments and feedback from others 	<ul style="list-style-type: none"> • Respond to critical comments and feedback from others • Use ICT and digital media in the development of a design project • Apply methods and tools that professional designers use

SUBJECT 2: Design – 3 ECTS

This subject combines lectures with readings, class discussions, and a three-phased comprehensive assignment on the subject of smart and innovative design, focusing on furniture design, product design, and interior design. The course offers a introduction into the subject area of Smart and Innovative Design tethered to digital design and fabrication tools fueling today’s 4th Industrial Revolution. The course is structured into three parts: a first theoretical part; a second that starts from a base design exercise (the design process) till the making of a final project; a collective presentation through which each student will show his smart and innovative furniture/ product/ interior projects.

UNITS:

- **UNIT 1 System Design for Sustainability (ecodesign)**

In this unit we are going to study:

- sustainable development and designer’s role;
- evolution of sustainability within design;
- Life Cycle Design: methods, tools, strategies, guidelines and examples;
- System (IPP) design for eco-efficiency: criteria, guidelines and examples

- **UNIT 2: Virtual and Physical Prototyping**

In this subject we are going to study methods and techniques for the realization of virtual and physical prototypes and their use in the design considering the

engineering and validation of industrial products in their life cycle. At the end of the subject we will acquire knowledges on the product-oriented approach to virtual prototyping, on the product development process, on system architecture, and on the efficient and integrated use of methodologies and technologies based on the paradigms of Virtual and Physical Prototyping for the concept, definition, simulation, analysis and validation of products in various domains (industrial products, consumer products, fashion, communication, etc.). Topics include methods and technologies for virtual prototyping, advanced 3D modeling of products, photorealistic rendering, real-time stereo 3D visualization of products, rapid prototyping, CNC milling, robotics, smart-wraps, and other digital innovation / technologies.

• **UNIT 3- The Design Process (Formal synthesis of product)**

In this subject we will study how to set up the skills to frame the problematic context in terms of project opportunities, constraints, possibilities, selection and hierarchy of priorities; to analyze the user-product interaction from the selection phase to the use phase up to the product disposal; to analyze artifacts and artefact systems in their formal, structural, functional, typological, morphological, relational, ergonomic characteristics, etc. In the design synthesis phase, this knowledge is merged into the development-project activities that involve the ability to translate needs into product requirements; to define, based on the performances required of the product, the materials, the component parts, the construction technologies and the assembly methods; to relate product qualities with essential industrial production constraints, with compliance with regulatory provisions and safety requirements.

• **UNIT 4- Role of designer within the manufacturing process**

This assignment is designed to guide redesign efforts (synthesis) in transforming the documented and analyzed product by retooling it into a more Smart and Innovative one. In this phase, we will explore, resolve, and present the transformed product side-by-side from the original to the documented product - discovering subtle or obvious characteristics of Smart design and Innovative design.

SUBJECT: DESIGN		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> • Methodological tools for analytical study and critical understanding of the intrinsic qualities of an industrial product • To relate the form to the use for which it was 	<ul style="list-style-type: none"> • Creative and practical ability • Drawing skills and strong visual awareness • An understanding of computer-aided design 	<ul style="list-style-type: none"> • The figure formed is a "technical project" that, at the conclusion of the training course, possesses the necessary skills to carry out the many technical-design

conceived, to the technical modalities that have enabled its concrete realization <ul style="list-style-type: none">• Develop a learning methodology related to the "project culture"• Methods and tools for system design for sustainability• Verification of the performances required of the product	(CAD) and other technological advances <ul style="list-style-type: none">• Knowledge of industrial processes and techniques• Communication skills• The ability to work to deadlines• Collaborative skills, particularly if working in a multidisciplinary practice• Methods and tools for system design for sustainability	activities of support and assistance to the project as it develops and is characterized at various stages ranging from the moment of concept, planning and control of the executive activity related to the realization of both the environments and the furniture design.
---	--	--

MODULE 7 (OM): 6 ECTS

SUBJECT 1: Materials– 3 ECTS

SUBJECT 2: Furniture process – 3 ECTS

LEADER TO DEVELOP CONTENTS:

SUBJECT 1: CONSORZIO DEL MOBILE – COSMOB

SUBJECT 2: SZKOLA GLOWNA GOSPODARSTWA WIEJSKIEGO – WULS

SUBJECT 1: Materials – 3 ECTS

With reference to the furniture sector, when we speak about materials, we mean various typologies such as glass, cardboard, metals, plastics and textiles of various kinds that are used in different ways generally combined with wood (solid or in the form of fibre or particleboard panels). Furthermore, we have to consider also binders, coatings and paintings since they are important elements for the realization of wood-based panels and/or in semi-finishing process.

Materials are an indispensable element of the furniture making process. Due to their significance in that framework, they are classified as:

- Basic: materials of fundamental importance, which create the basis for final product, i.e. a ready piece of furniture (they include materials of solid wood (such as sawnwood, veneers, glued furniture panels), composite wood materials (wood-based panels), and

wood composites (wood and wood-based materials combined with non-wood materials),

- Complementary: finishing materials, which improve functional and aesthetic properties and design of furniture (foils, lacquers, wood stains etc.).

The selection of appropriate materials for the production of furniture has a bearing on the quality, durability, the possibility of renovation and application of final product.

Materials for the furniture industry can contain “novelties” of different nature. They can be connected with the changes of the production technology and material structures or properties and applications. The following things can play the role of a novelty carrier:

- New or improved materials (basic or complementary) for the production of furniture,
- New or improved/changed features and properties of materials for the production of furniture (such as: durability, strength, the possibility of renovation, functionality, eco-sustainability, etc.), which eventually also influence the features and properties of final products,
- New or changed applications of materials (basic and complementary) in the production of individual types of furniture, which most often also determine the applications of final products.

It's important to highlight that technical specification are required: in case of materials or final products a document containing technical requirements must be available. Sometimes technical specification also contains procedures for the evaluation whether the requirements are fulfilled. Materials can also benefit of the application of digital technologies to improve logistics efficiency and operator activity through systems for their identification and location in warehouse operations, thus facilitating the preparation of production orders, storage of goods, replacement management, inventories, etc.

Another important aspect is the eco-sustainability and in particular the recyclability at the end of the product lifecycle, as well as the management and saving of raw materials. Such criticisms have recently been taken into account by the sector through the development of alternative solutions or the integration with other typologies of materials, a key element of innovation and implying the use of recycled, recyclable materials of natural origin and / or biodegradable such as cardboard, glass, cork, bamboo and leather. Market demands and the orientation of the Community legislative framework (e.g. Circular Economy) clearly show that this is the direction that companies must pursue.

UNITS

- **UNIT 1: Materials science and new materials**
- **UNIT 2: Converting demand requirements into schedules for inventory acquisition**

- **UNIT 3: Calculate key inventory performance metrics**
- **UNIT 4: Inventory management**
- **UNIT 5: Communications with suppliers and with company departments**
- **UNIT 6: Sustainability**

SUBJECT: MATERIALS		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> • New materials. • Eco-sustainability of materials • Future trends 	<ul style="list-style-type: none"> • Development a basis for systematization of new materials for the European furniture industry • Identification of new and eco-sustainable materials for the European furniture industry • Definition of future trends in the development of materials for the European furniture industry 	<ul style="list-style-type: none"> • Technical (chemical, physical, environmental) • Economic

SUBJECT 2: Furniture process – 3 ECTS

Subject is specific to furniture industry. It provides basic information about whole production technology, beginning from material itself, going through processing of solid wood and wood based materials, including mechanical processing, finishing, assembly - up to the end of production, safe handling and storage.

UNITS

- **UNIT 1: Materials for furniture making**

Subject contains basics of furniture-making materials, along with designation and basic specifications.

- **UNIT 2: Tools and machinery**

Review of machinery and tooling used in furniture and woodworking industry.

- **UNIT 3: Solid wood processing**

Topic describes technology of solid wood preparation for furniture industry needs

- **UNIT 4: Solid wood furniture**

Review of technology and production techniques used in furniture made of solid wood. Traditional and contemporary joinery.

- **UNIT 5: Furniture made of panel products**

Review of technology and production techniques used in furniture made of panel products, like particleboard, medium density fiberboard, etc. Edge banding, connectors.

- **UNIT 6: Uses and applications for veneers and laminates**

Topic describes veneering and finishing of products by laminates

- **UNIT 7: Sanding**

Description of machinery and tools used in sanding of wood and wood-based materials, like grit sizes, techniques, applications

- **UNIT 8: Gluing**

Subject deals with glues and gluing techniques used in furniture making

- **UNIT 9: Fitting mechanical or electrical components to furniture**

Mechanical and electro mechanical fittings in furniture, hinges, connectors, etc.

- **UNIT 10: Finishing**

Technology of wood finishing, coating, paints, stains, varnishes, drying, polishing, pressing

- **UNIT 11: Assembling**

Assembly of furniture, packaging of finished or self-assembly furniture

- **UNIT 12: Safe handling and storage**

Rules of storage, transportation, handling of materials and ready furniture

SUBJECT: FURNITURE PROCESS		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> • Basics of technology • Basics of material science • Mechanical processing of wood and wood based materials • Gluing technology • Finishing technology • Assembling, packaging and storage of finished products. 	<ul style="list-style-type: none"> • Ability to work, understand and improve technology of furniture. • Ability to use knowledge of production stages in the production process. 	<ul style="list-style-type: none"> • Working in the production process as the supervisor. • Managing company's technology and production routines in accordance to knowledge, good practices and standards existing in furniture production. • With the help of other modules, one can apply innovation to the technology or improve processes.

MODULE 8 (OM): 6 ECTS

SUBJECT 1: Logistics, warehouse, distribution & supply chain management – 3 ECTS

SUBJECT 2: Sales and Marketing – 3 ECTS

LEADER TO DEVELOP CONTENTS:

SUBJECT 1: CENTRO TECNOLÓGICO DEL MUEBLE Y LA MADERA DE LA REGIÓN DE MURCIA

SUBJECT 2: BUCKINGHAMSHIRE NEW UNIVERSITY

SUBJECT 1: Logistics, warehouse, distribution & supply chain management – 3 ECTS

The subject of “Logistics, Warehouse, Distribution and Supply Chain Management” is a basic material for the exercise of activities of management and direction of the logistics department in companies that work in the furniture sector, and therefore their knowledge is fundamental for the training of the students who take this course.

The area of Logistics currently represents one of the areas of greatest growth and interest for the furniture sector. Logistics includes all the activities necessary to move products and the flow of information among the members of a supply chain. These chains, which in complex cases become real networks, are the system used by companies to provide goods, services and information to their external and internal customers. The efficient management of this chain or logistics network is today a great challenge for most companies given its importance in business competitiveness. For this reason, logistics has advanced to the operational management of warehouse and transportation to the strategic direction of the company.

In the current supply networks there is a tendency to reduce manufacturing centers and increase warehouses; this can be clearly seen in the furniture sector. Therefore, the purpose of this module is to provide the student with a global and practical view of the operation of the stores, so that they can take responsibility for its management and improvement.

This subject introduces the problems associated with the design and management of distribution networks in the internal supply chain. The different types of networks and the means of physical distribution or handling means most commonly used for efficient internal transport are described.

Thanks to this subject the students of this course will have full knowledge of the functions and types of warehouses that exist, how a Warehouse Management System works, the existing typology of inventories, their management and the calculation of the optimal batch for Deterministic demands and especially the process of despatching to the last detail giving special importance to the delivery note of in and out of the product.

After completing this subject, students must achieve an understanding of the essential concepts to organize the storage of goods under the conditions that guarantee their integrity and the optimal use of available media and spaces, according to established procedures.

Analyze the storage processes and stock management methods applicable in the organization of a warehouse, assessing the internal distribution and the handling system of the goods, applying the current regulations on safety and hygiene, guaranteeing their integrity and optimizing the available resources, to organize the storage of the goods.

Once completed this subject, the student will have full notions of knowledge required for the design, management and control of a warehouse of furniture and related sector.

UNITS:

- **UNIT 1: Business and supply chain strategy**

In this subject we are going to study a definition and introduction to the logistics of the supply chain.

- **UNIT 2: Warehousing**

In this subject we are going to study a definition of storage and warehouse functions and types.

- **UNIT 3: Warehouse management systems**

In this subject we are going to study a definition, functions and advantages of a Warehouse Management System

- **UNIT 4: Transportation, distribution, logistics**

In this subject we are going to study a definition of zones of a warehouse, such as storing products and means of maintenance.

- **UNIT 5: Distribution requirements planning, inventory management**

In this subject we are going to study a definition of types of inventories, methods of valuation and distribution of these.

- **UNIT 6: Calculation of the optimal lot.**

In this subject we are going to study a conditions and method for the calculation of the economic quantity of order with deterministic demand.

- **UNIT 7: Dispatching**

In this subject we are going to study the process of dispatching, how we must to do it and the importance of delivery note.

• **UNIT 8: Security and hazardous materials regulations**

In this subject we are going to study a technical guide on occupational safety and health that is a reference in the sector in the field of prevention of occupational risks and helps to reduce the accident rates.

SUBJECT: LOGISTICS, WAREHOUSE, DISTRIBUTION & SUPPLY CHAIN MANAGEMENT		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> • Knowledge relating storage and warehouse functions and types. • Knowledge and recognition of the most relevant Warehouse Management System (WMS) tools. • Knowledge of types of inventories, methods of valuation and distribution of these. • Conditions and method for the calculation of the economic quantity of order with deterministic demand. • Knowledge about the process of dispatching of goods. • Knowledge on occupational safety and health in the different area of the production plant. 	<ul style="list-style-type: none"> • Be able to identify the different types of warehouse and its functions. • Adapt WMS tools to a Furniture company. • Be able to use different methods of valuation inventories and identify it. • Be able to use different method of calculation the economic quantity of order with deterministic demand. • Be able to perform the process of dispatching of goods. • Analysis and identification of potential occupational safety and health. 	<ul style="list-style-type: none"> • Manage the warehouses from furniture and woodworking industries. • Carry out the most suitable plant layout at a furniture/wood products manufacturing plant. • Implement a WMS tool in a Furniture company. • Implement and assess a valuation of inventory of a furniture company. • Performance the process of dispatching of goods in a furniture company. • Develop and implement a plan of occupational safety and health in a furniture company.

SUBJECT 2: Sales and Marketing – 3 ECTS

This subject aims to introduce you to three key areas where marketing impacts on society at large. Its potential for use and abuse is considered in Sales & marketing; Ethics and marketing and Responsible business marketing.

This subject guide describing the comprehensive introduction to marketing and its main principles. This subject is a mixture of lectures, discussion and group work, all of which aim to explore how individuals and organisations can gain a competitive advantage by applying marketing tools and techniques and by adopting a customer orientation. Ethics and marketing looks at the conduct and consequences of marketing activities from an ethical standpoint. Students will learn about various ethical frameworks as well as considering what is meant in marketing by ‘ethical behaviour’.

UNITS:

- Sales & marketing

- Ethics and marketing

- Responsible business marketing

SUBJECT: SALES AND MARKETING		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> • The nature of businesses and other organisations, including organisational structure, culture and values. • The principles of the main business functions (sales, marketing, resource management) • The principles of business ethics 	<ul style="list-style-type: none"> • Selecting and analysing information relevant to a particular problem or issue related to maintenance management. • Selecting and analysing information relevant to a particular problem or issue related to business and management • Applying theories, models and concepts to practical situations. • Framing and addressing questions in relation to business and management • Interpreting, using and presenting numerical information effectively and appropriately 	<ul style="list-style-type: none"> • Uses a variety of techniques/formats, selected to suit the needs of others and to aid understanding. • The nature of businesses and other organisations, including organisational structure, culture and values. • The principles of the main business functions (human resource management, accounting and finance, and marketing). • The principles of business ethics and the main social and environmental issues faced by businesses and other organisations.

MODULE 9 (OM): 6 ECTS

SUBJECT 1: Workplace, leadership & personal effectiveness competences – 3 ECTS

SUBJECT 2: Industrial Property Rights and Entrepreneurship – 3 ECTS

LEADER TO DEVELOP CONTENTS:

SUBJECT 1: SZKOLA GLOWNA GOSPODARSTWA WIEJSKIEGO – WULS

SUBJECT 2: SZKOLA GLOWNA GOSPODARSTWA WIEJSKIEGO – WULS

SUBJECT 1: Workplace, leadership & personal effectiveness competences – 3 ECTS

This subject familiarizes the students with basic concepts of the workspace, leadership and service management theories and the evolution of management processes. It provides knowledge on basic management functions, and thru some synthetic information on soft skills related to the topic, helps to solve problems related to the management of the most important areas of business.

UNITS:

- **UNIT 1: Awareness of the needs of others**

Empathy. Analysis of the needs of others. Training on development of empathy skills and analysis of needs& providing suitable solution.

- **UNIT 2: Supporting staff**

Competences. Creative competences. Disruption possibilities. Career intend. Brain dominance index. Team building.

- **UNIT 3: Effective communication**

The art of communication. Element of communications, content and context- words, tone, body language

- **UNIT 4: Interpersonal skills**

Building relationship. Influencing, persuading.

- **UNIT 5: Leadership**

Leadership styles - directing, coaching, supporting and delegating. Maturity level of the leaded group. Effectiveness of the team and individual performance

SUBJECT: WORKPLACE, LEADERSHIP & PERSONAL EFFECTIVENESS COMPETENCES		
Knowledge	Skill	Competence
	<ul style="list-style-type: none"> • Ability to recognize others' strength and weaknesses and build a work team. • Ability to build professional relationship. • Ability to lead the group 	<ul style="list-style-type: none"> • Ability to manage company's workspace as a leader in accordance to current knowledge on human communication, interpersonal skills and leadership practices.

SUBJECT 2: Industrial Property Rights and Entrepreneurship – 3 ECTS

The purpose of the subject is to familiarize the student with basic concepts and principles related to the protection of intellectual property, ie. copyright, and industrial property rights, which decide on competitiveness and innovation in the modern economy [patents for inventions, trademarks]

The subject is meant to deepen knowledge in practical areas that are current for entrepreneurship, including: identifying business opportunities in the wood industry, managing a new business and creating the concept of its development, as well as shaping individual leadership skills.

UNITS:

- **UNIT 1: Industrial Property Rights**

Intellectual property overview - Types of intellectual property, Protection of intellectual property.

Patents - Purpose of a patent, Structure of a patent - necessary content,

Legal requirements - timing, content, international protection

Patenting process - Internal ant Patent Office

Alternatives to patenting

Claims - Descriptions of claims, review of claims
 Basics of commercialization - Licensing of Intellectual property

• **UNIT 2: Entrepreneurship**

- Opportunities – selection of right opportunity
- Target Markets and Business Models
- Teambuilding
- Entrepreneurial finance - milestones and financial models
- Venture capital
- Development of strategy and product roadmap
- Development of manufacturing
- Development of sales & distribution
- Development of marketing plan
- Financial model and funding strategy
- Pitches and speeches, presentation of the project to investors

SUBJECT: INDUSTRIAL PROPERTY RIGHTS AND ENTREPRENEURSHIP		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> • Basic concepts and principles of industrial property protection and copyright law. • Knowledge about business opportunities. Basic knowledge about establishment and managing of a company. 	<ul style="list-style-type: none"> • Search, understand, analyse and use the information needed in the field, from various sources and in various forms relevant to the furniture production. • Think and act in an entrepreneurial way, realizing the importance of innovation in the furniture industry. • Skills of working in a group • Creation of a concept and business plan of an enterprise. 	<ul style="list-style-type: none"> • Identification of innovation, research on the topic, filing patent application form, application of the patent in an enterpsise. • Basic ability of setting up and leading an enterprise.

SUBJECT 1: Information Search and Retrieval – 6 ECTS

SUBJECT 2: Investigation Methodology – 6 ECTS

LEADER TO DEVELOP CONTENTS:

SUBJECT 1: UNIVERSIDAD DE MURCIA

SUBJECT 2: UNIVERSIDAD DE MURCIA

SUBJECT 1: Information Search and Retrieval – 6 ECTS

In this subject, students will have the opportunity to learn how to seek for information, gather and analyse it in a useful and properly way. Thus, it is aimed to all students, not only those whose objective is the scientific research, although it is mandatory for them.

Thereby, we establish a main objective in the search for resources of information of any class, so that in that way, students may be able to recover it. For that, they will be taught about how to analyse the sources of information to discriminate those which are interesting for their work.

Special attention to the web and its possibilities will be granted so as techniques of information retrieval applied to furniture sector as well as for scientific research.

Thus, the subject begins with an overview importance of the web, because it's huge incidence and resources, so the students could know the methods, techniques and tools for a useful internet search. This, in the society of the *disinformation*, due to the big amount of data available, it is more obvious that skills in the search and process of this data are needed.

Therefore, this knowledge will provide students the ability of reinforce and accelerate communication between science and the furniture sector: it stimulates paper publication, distance learning and it's a useful tool for marketing.

UNITS:

- INFORMATION, SEARCH AND RETRIEVAL

SUBJECT: INFORMATION SEARCH AND RETRIEVAL

Knowledge

Skill

Competence

<ul style="list-style-type: none"> • Information retrieval on the web • Information retrieval evaluation • Applied techniques to science research • Utilities, tools and problems • Data collection and evaluation techniques 	<ul style="list-style-type: none"> • Gather and interpret relevant data • Develop the necessary learning skills to undertake later studies with a high degree of autonomy • Work in teams and communicate their own ideas by creating an enabling environment, as well as the ability to integrate into a common project aimed at obtaining results • Identify the strengths and weaknesses of an organization, a product or a service, establish and use indicators, develop solutions to improve quality • Obtain, process and interpret data 	<ul style="list-style-type: none"> • Manage online resources • Basic education for autonomous research • Team work • Recognise quality factors • Understand big quantities of information
--	--	--

SUBJECT 2: Investigation Methodology – 6 ECTS

In this subject we set out to achieve various general objectives. The first of them is to introduce the students to the world of research, so that from this knowledge they can investigate through the optimal use of techniques, methods and documentary resources. This way, there will be set the bases so that students can start to contemplate research as a possibility for working in the furniture field, such as the dissertation and doctoral thesis. For that, students will be taught about each and every one of the stages of the investigation and qualitative and quantitative research techniques.

At the beginning of the course, there will be presented the ethic bases of modern science, while the students learn how the scientific method works. Thus, they will know the meaning of the investigation, its function in the furniture and wood sector, its typologies and each of one of the

stages that compose it. Consequently, they will have the knowledge of how to develop an investigation in the correct way, no matter if it's by themselves or as a part of a collective.

As the students will know how to research, next step taught is how to share their results, i.e. how to find a scientific publication, and to prepare their results. In order to find a proper publication, there will be space for quality indicators and impact index. In the same direction, this information will provide them the resources for keeping their knowledge updated.

Finally, two more topics will be attended: scientific meetings and research projects so that the individual formation acquired until then could be used to achieve greater goals.

UNITS:

- INVESTIGATION METHODOLOGY

SUBJECT: INVESTIGATION METHODOLOGY		
Knowledge	Skill	Competence
<ul style="list-style-type: none"> • Science and philosophy of science • The investigation. Meaning, function, typology and stages • Personal and collective ethics of research • Scientific publication • Methods of updating knowledge • Scientific meetings • Research projects 	<ul style="list-style-type: none"> • Acquire the knowledge of the general framework in which experimental science is developed • Know of the requirements of the scientific method and its philosophical foundations • Know the ethics of the researcher's activity • Identify how to present a project to get funding • Integrate in a scientific community • Gather and interpret relevant data 	<ul style="list-style-type: none"> • Basics of scientific method • Research integrity • Projects making • Team work • Understand big quantities of information • Basic education for autonomous research

	<ul style="list-style-type: none">• Develop the necessary learning skills to undertake later studies with a high degree of autonomy	
--	---	--

PRACTICES – 12 ECTS

This part involves a traineeship abroad for the student.

This Master is a construction of 4 Universities of 4 different countries (Spain, Poland, UK and Italy) and 3 partners with direct contact with furniture enterprise (2 Technological Centres who are working with more than 100 enterprises in Italy and Spain and the association of British Furniture Manufacturers); in this subject, the contact between the partners will be really important and the fact of the idea of the implementation of the Master in these 4 countries.

These practices will consist in a traineeship period in a company in a different country where the student is doing the Master. The student has to put in practice the knowledge, skills and competences that they have acquired during the Master. For that, this subject will be always done, in the moment that the student has passed the rest of contents of the Master (except “dissertation” that it could be done after “practices”).

In this subject it will be an organisation who will be responsible of the student, this one will be the university where the student is doing the Master, and a Host Intermediary organisation who will be the responsible of the host enterprise in the country where the student is going.

Both organisations have the obligation of providing help and assistance during the length of “practice” subject.

The student has to prepare a full CV including their professional experience, moreover, the student has to add his interest about the possible kind of enterprise and tasks that he/she want to do there.

With that information, the Host Intermediary organisation will look for the most appropriate enterprise to receive the student according his interest. It is important that the proposed host enterprise has proven experience in furniture sector and could give the student tasks that will give him relevant learning opportunities, for that, the host has to describe previously the activities that the student could do during the traineeship. It is important that in the host organisation there will be a person who speaks English fluently. Finally, a CV of the organization will be prepared.

After the proposal of the host enterprise, the student has to accept or refuse with justified reasons the offer. In case of refuse, it will be offered a second organization, in case of acceptance, it will make

the practice commitment between them according the length of stay (including hours per day) and tasks.

Intermediary organisations must ensure that student and host enterprise are aware that they may need to sign agreements as those ones related with confidentiality.

Before going abroad, the student should participate in a pre-departure induction course of 5 hours in order to be prepared for the traineeship.

The duration of stay abroad is two months at least and four months at maximum, depending the number of hours per day until completing 200 hours of practice. This stay could be completed in multiple periods

At the end of the traineeship, the student has to prepare an explanatory document about the apprenticeship, including their tasks, the skills that he/she has acquired, the achieved goals... and a presentation of 30 minutes in order that the tutor could consider if the student has used this period abroad with benefits.

In order to sum up, this “practices” will have 12 ECTS: 5 hours of pre-departure induction, 200 hours of traineeship in an enterprise, 80 hours of preparing the explanatory document and the presentation and 15 hours of mentoring program to solve doubts of the student.

DISSERTATION – 9 ECTS

It consists in the application of every knowledge, skill and competence that they have been developed during the Master. The student has to prove that they have achieved the goals that this Master has planned. The student has to develop an innovative project related to one of the subjects of the Master. Each partner will have assigned a tutor who will give an academic support but he/she will not be the liable of the final result. The tutor will be assigned after the students have selected the subject to prepare their project. After this, the tutor could give different wide possibilities inside each subject.

The tutor could give some information to the student about Module 10 - Investigation Methodology I and II in case of necessity; and give some notions about what is the final objective with this “Dissertation”. Innovation could be applied to any part of the project (contents, methodology, materials, tasks...)

Project may have between 45-55 pages, including, if it is appropriate, the index, bibliography and references and annexes.

It will be included, among other things, the following parts:

- Justification of the project

- Theoretical framework – state of art
- Objectives
- Personal reflection
- Bibliography

The student has to defend the project, the final mark in this subject would be split in 40% corresponding to the public exposure and 60% corresponding to the quality of the project. The oral presentation will last between 12 to 15 minutes, accompanied by a round of questions, comments and suggestions from the evaluating members. After that, the student will have the chance to clarify, specify or answer to the asked questions.

14 Guidelines for trainers

A commitment was made within the IMFUTURE project to develop Guidelines for the Trainers involved in delivering the content for the training material for the “Master programme”. The Guidelines below are largely based on materials produced by (a) European Centre for the Development of Vocational Training (Cedefop), (b) the City and Guilds Centre for Skill Development in the UK, (c) the Handbook of VET Providers, published by Human Capacity Development (HCD) for Vocational Education and Training produced (Mannheim), Germany.

The ideas presented in these Guidelines could be read by all those engaged in Master’s as a standalone text that could guide the thinking and the practice of preparing young people for any profession at vocational level. The intention is to offer readers an opportunity to reflect on their own practice and to enrich it by exploring what others do successfully. The bibliography at the end could serve as a tool for those who intend to explore in more depth some aspects of teaching and learning at all levels but mostly connected to Master’s education.

14.1 Basic concepts utilised

It is assumed that all those involved in teaching within HE institutions are qualified and possess an adequate level of knowledge and practical skills. The guidelines intention is just to remind teachers of the main elements that are considered ‘good practice’ at a European level. The framework developed by Hopkins, 2007 has been widely used in Europe as it highlights key elements that should be considered for effective teaching – Teaching Skills, Teaching Relationships, Teacher Reflection and Teaching Models. The framework is widely used to analyse examples of vocational teaching and learning in practice. The ‘framework’ contains essential components that could guide the novice or the advanced teacher and synthesises the best practice.

Teaching relationships

- It is widely admitted that teachers' commitments to their learners – the relationships they develop with their learners and the range of roles that teachers take – are crucial components in VET as well as in any other educational environment at all levels.
- Teaching relationships refer to the relationships teachers develop with their learners as well as how learners relate to each other. The tutor-learner relationships are identified as 'the most important link in the learning process', (TLRP, 2006). A meta-analysis of learner-centred teacher-learner relationships confirmed its importance. It seems that positive teacher-learner relationships are associated with optimal, holistic learning with above average mean correlations when compared with other educational innovations for cognitive and behavioural outcomes (Cornelius-White, 2007).
- The way in which a teacher interacts with learners sets the scene for the subsequent learning to take place. Teachers felt that their relationships with learners were of prime importance for the teaching and learning to be effective. The features of effective teacher relationships included:

Getting to know learners, knowing which learners need more attention

Good rapport – listening, high expectations

Building trust

Humour – used appropriately and never descending to sarcasm

Relaxed atmosphere – relaxed learning with elements of fun

Mutual respect – respect of other people's opinions

Behaviour management – so that all of the group have the chance to learn.

Active learning, while carrying out assignments or projects, for instance, gives many opportunities for teachers to build relationships with learners. The teacher's role during this activity can take various forms: demonstrator, organiser, coach, mentor, facilitator, reflector and even co-learner. A relationship of trust between the teacher and learners is likely to develop while working together and discussing issues at various stages of the assignment, so that the teacher becomes an 'accomplice' in the learning process rather than the knowledge base.

Teaching models

Research conducted in Europe highlights the fact that few teachers use a particular model or strategy with clear intent. The way in which teaching takes place is strongly influenced by a series of circumstantial and educational factors. Models are prescribed structured sequences, which are designed to elicit a particular type of thinking or responses, to achieve specific learning outcomes. However, it is very useful for teachers to understand the concept of a teaching model and to comprehend the main features of the many existing models.

Teaching models are derived from theories about teaching and learning. Each model can be described as a structured sequence, which is designed to elicit a particular type of thinking or response, to

achieve specific learning outcomes. The choice or use of the appropriate model, or combination of models, is influenced by the type of learning objective and nature of the learner as well as other factors such as teaching strategies and teaching skills. A strong body of research and practice suggests that the consistent use of specific models can make learning more effective (DfES, 2004, Hattie, 2009 and Marzano, 1998).

The term ‘teaching model’ has been used to describe many other approaches. In different documents a number of terms appear to be used interchangeably – models, strategies, approaches, techniques, and methods name just a few. Teaching models are not the ‘real world’ but merely a way of helping us understand and think about teaching. There are a vast number of teaching models – some are variations of others – and they come in many shapes, sizes, and styles. Some terms, such as ‘demonstration’, can be used for both a teaching model and also a strategy or method. To draw the distinction between a teaching strategy and a teaching model, the definition of a used teaching model has two distinctive features. The first distinctive feature is the nature of the learning objective and outcome required and whether the learning is related to:

- Acquiring and learning skills, procedures, knowledge, and the like, or
- Processing information, building concepts and rules, generating and testing hypotheses and thinking creatively, or
- Collaboration and learning together to construct new knowledge and understand concepts.

The second distinctive feature is the structured sequence of steps or phases (the syntax) used to achieve that particular type of learning objective. In teaching models, it is the tight linkage between these two aspects that defines a teaching model. Strategies do not have the same linkage and may be deployed more widely, as an essential part of a teachers’ repertoire to achieve a range of learning outcomes.

- The term teaching model is also used in vocational teaching and learning to describe other different concepts. If these concepts lack the distinctive linkage between the two particular features above, then they are not what is mean here by a teaching model.
- In developing teaching models in the vocational context, it is useful to compare teaching models to find the similarities and differences between the models. This could then serve as a guideline to teachers when selecting or adapting a teaching model or combination of models. The work of Ji-Ping and Collis (1995) offers suggestions for comparing models using a set of appropriate questions to answer against each teaching model. With adaptation, this could provide a useful basis for further work in vocational learning. There are four aspects suggested: teacher aspects, learner aspects, the degree of flexibility or adaptability of the models and aspects related to effective theoretical and technological supports. The following are some specific questions for each aspect that can be used in a comparison of teaching models.

1. Teacher Aspects

- a) How easily can the average vocational teacher manage the model?

- b) To what extent does the model save teaching time (including preparation time for the lesson)?
 - c) How likely is it that the model will be accepted and used by the average teacher?
 - d) To what extent does the model give full play to the teacher's professional knowledge or skill?
2. Learner Aspects
- a) How much initiative is given to learners within the model?
 - b) How adaptable is the model to individual differences in the learners?
 - c) How well can the model be adapted for learners of different ages?
 - d) How well can the model be adapted for different sorts of learning goals?
3. Flexibility and adaptability
- a) How easily can the model be adapted to the present organisational system in the vocational area and to the current standards for learner assessment?
 - b) Can the model be well adapted to a variety of vocational areas?
 - c) How easily can the model be combined with other models?
 - d) To what extent is the model adaptable to cultural expectations for learner and teacher behaviour?
4. Theoretical and Technological Supports
- a) Was the model developed using an appropriate theory?
 - b) How much research and evidence are available to show the model is internally valid?
 - c) In what ways might the model be well supported by technologies and media?
 - d) Are the technologies and media most suitable to the model readily available?

This structure for analysis of models could offer a good starting point to begin to identify which teaching models are most appropriate for vocational education and to identify the relevant aspect of each of the teaching models.

Direct teaching and programmed learning

Direct teaching, one of the 'classical' ways of teaching is particularly effective in enabling learners to acquire skills. It is a very structured approach involving a high level of interactivity which is teacher-directed and involves direct communication usually with a whole class, although it might be undertaken with an individual or a small group of learners. Direct teaching has the highest level of effect among the range of teaching strategies, though this may be in part because 'Direct Instruction' is a 'Russian Doll' that includes many other strategies such as active learning, reviews, and homework, so there is an additive effect (Petty, 2009). This model usually involves direct input from the teacher together with a strategy of modelling or demonstration and clear instructions to the learners. The

teacher then checks the learners' skills or understanding, provides guided practice and ultimately the learners undertake independent practice.

Programmed learning is a self-paced, self-administered programme (computer based for example) presented in a logical sequence and with much repetition of concepts or skills.

- Sequence of Activities (syntax)
- The lesson starts with the learners all at the same stage and the teacher employs direct teaching.
- *Phase 1* – In the first session, the teacher logs on to the computer with the screen visible to the learners on the wall and the learners log on to their computers. The teacher draws the square first, as it's the easiest. The teacher clicks on the line tool and tells the learners to find and click on the line tool. The teacher draws a line of a given length, 45mm. As she demonstrates, she describes what she is doing.
- *Phase 2* – The learners select the tool and draw the line of 45mm and then draw a square.
- *Phase 3* – The teacher questions the learners and checks their progress, guiding them as required.
- *Phase 4* – Once they are confident, learners practise by drawing squares of different sizes on their own.
- The teacher demonstrates the tools necessary to draw a circle and the cycle of phases repeats. The session proceeds step-by-step until all the tools and skills have been covered. When an individual learner is stuck, the teacher sits next to the learner, takes the mouse, demonstrates and describes what to do, then asks the learner to do exactly the same. If the learner makes a mistake, the teacher explains what is wrong and makes the learner repeat the task correctly. The learner practices until the skill is established and the teacher does not take the mouse again but might point to the main screen or question and prompt the learner if required.

Direct teaching using physical guidance

In a design session, the teacher provides direct teaching with physical guidance to help learners acquire the learning objective of mastering the skill of modelling. In terms of context, the session takes place in a workshop. The teacher is also concerned with his relationship with the learner. He is very aware of the issues of personal contact and invading personal space so ensures that he has the learner's consent for physical contact. The teacher guides the learner and progressively removes his support, a process described as 'scaffold' learning.

- Sequence of activities (syntax)
- The teacher had previously demonstrated modelling.
- *Phase 1* – The teacher asks the learner if he minds if he guides his hands; the learner agrees. (The teacher points out that if the learner had objected, he would not have done so.)
- *Phase 2* – The teacher holds both of the learner's hands as he starts to model because the learner does not yet have the fine motor skills.

- *Phase 3* – The teacher tells the learner that she is slowly going to take her hands away and she wants the learner to carry on. (She explains that if she had just removed her hands without warning, the learner’s hands would have gone up).

- *Phase 4* – The teacher removes her hands and the learner continues to model unaided.

The teacher comments that it is a contentious technique but it is an effective way of teaching someone to model. She points out that often they hold the mould too far away from the work. Teaching them the right distance is important, as the learner needs to operate safely. ‘If you tell them to go closer they might go too close and then the model could dip into the pool and splash.’

Direct teaching using demonstration

There are a number of ways of implementing the direct teaching model. The model presented here is known as the ‘PAR’ model: ‘Present, Apply and Review’, which is a structured-skills version that could be suitable for many vocational areas.

- There are three stages:
 1. Present new material
 2. Apply this new learning (learner activity)
 3. Review the skills learned in this lesson.

The teacher in this session uses the teaching model of direct teaching and the strategy of demonstration as the tool, in this case, to present new material and achieve the learning objective of acquiring the skill of technical drawing.

- Sequence of activities (syntax)
- *Phase 1* – The teacher sketches a drawing on the white board. This is done in stages, to teach the learners how to do a technical drawing.
- *Phase 2* – The learners copy the drawings stage by stage, as the teacher does them.
- *Phase 3* – Once the learners have completed their drawings, the teacher talks about what they have copied, goes round to each learner and provides feedback, praising good drawings and indicating where they need to improve.

The teacher points out the importance of being able to draw so the customer can see exactly what the technical specialist is intending to do...‘and this is why tradespeople should be able to express themselves not only in the written word but in sketches.’

Enquiry

The use of the enquiry model helps learners to collect information, build concepts and test hypotheses.

Sequence of activities (syntax)

- *Phase 1* – The teacher welcomes the learners and outlines the learning objectives for the day. She provides five questions relating to, for example, health and safety statistics and directs the learners to the Health and Safety Executive website.
- *Phase 2* – The learners search to find the answers and record their answers. While they are doing this, the teacher informs them that they will be asked to give a brief presentation of their findings.
- *Phase 3* – The teacher asks for volunteers to present their findings.
- *Phase 4* – Following the presentations there is class discussion facilitated by the teacher.
- *Phase 5* – The evaluation phase is not completed in this session but there is a short quiz and recap in the next session in terms of what was hard and what was easy, what they needed to be aware of.

The teacher knows from experience that by simply telling the learners the relevant statistics, those learners would think it was ‘boring’ and would be unlikely to remember the information. Through the use of this model, the learners are actively engaged in researching the information and the impact is increased by the presentation of their findings to the rest of the group, thus reinforcing the learning. The teacher’s skill is used to ensure that over time *all* learners present their findings, not just the ones that volunteer as they will probably comprise a relative minority.

Developing higher-order skills

Often teachers are actively attempting to develop learners’ thinking and learning skills in addition to meeting the course requirements. The development of higher-order skills is important for transition between qualification levels and also as 21st century employability skills.

For example the learning objective is concerned with developing the learners’ higher-order research and analytical skills. Although the task involves developing their knowledge about computer-assisted design systems and developing concepts involving deductive reasoning and comparing systems, the teacher suggests that it is the development of the higher order skills that is important. These are the skills that the learners will need to be able to use in the workplace.

- Sequence of activities (syntax)
- *Phase 1* – The teacher provides learners with information about user needs.
- *Phase 2* – Learners have to carry out research on their own. They have to analyse systems, to compare systems, to identify what components could improve the system and the reasons why.
- *Phase 3* – The learners report back and justify the suggestions they make for improving the systems.

The teacher indicates that through the activity, the learners are developing research and analytical skills – the type of skills they will need in the workplace – without really realising they’re doing it. ‘They’ll be just asked to carry out the task, but underpinning that they’re looking

at those higher order skills where they're researching, they're analysing computer systems – different computer specifications. They're suggesting upgrades, they're justifying the upgrades for it – and not just listing them; they 're justifying why that's a justifiable upgrade to that particular system.'

Constructivism, group investigation

Group investigation attempts to recreate a democratic atmosphere in the classroom where the learners work together to solve a problem. The contribution of each member of the group makes the outcome better than if individuals do it. Group investigation puts the learners in charge of the learning and allows them to investigate what interests them most. (Sharan and Sharan, 1989).

- Group investigation goes beyond cooperative learning and follows the following six steps:
- Learners are given a problem
- They discuss ways to solve it
- They plan how to carry out the investigation in a group and assign roles
- They work together and independently
- They analyse progress and report findings, and the process is evaluated (Abordo and Gaikwad, 2005).

The example below shows some of the elements of constructivist learning and group enquiry while not following the entire model. The learning objective is for learners to be able to identify the country and age where a certain furniture object is located. The teacher in a history of design session helps learners to construct knowledge about the history of furniture design and where in the world objects are located. The teacher initially draws on learners' current knowledge and experiences. She then introduces concepts of known and unfamiliar furniture object and then arranges a series of tasks to enable learners to construct their knowledge of both location and period of time when these were produced.

- By asking the learners to produce displays, the teacher could assess the learners' new knowledge by seeing what they had found and by asking them questions.
- Sequence of activities (syntax)
- *Phase 1* – To introduce the topic, the teacher provides the learners with a sheet giving an overview of pieces of furniture and their location in time and space. She then leads a discussion by picking out one of the destinations and asking who has seen similar pieces. The discussion is split between European and worldwide attractions and includes famous furniture objects such as the thrones of different monarchs – objects with which learners are familiar, even if they have not seen one.
- *Phase 2* – The teacher shows a short video of an unfamiliar furniture style – the rocking chair of Churchill – and indicates where it is located.

- *Phase 3* – The teacher gives the learners an A4 copy of the map of the world and lots of furniture brochures and magazines. The task is to find pictures in the brochures of as many famous furniture artefacts as possible, to indicate on the world map where these objects are located, and to make a display on a large sheet of paper. The learners look at the Atlas to identify the locations and the year.
- *Phase 4* – The learners have to research two interesting facts about each furniture piece to add to their displays. They also have a furniture design guide that they can use.

Constructivism using debate

In this case, the teacher used a learning activity in the form of a debate to enable learners to develop their concepts and understanding of the differences between two different types of tools. There was a subsidiary learning objective to this activity, developing the skills necessary for a debate. The functional skills of communication and listening were thus embedded in the activity.

- Sequence of activities (syntax)
- *Phase 1* – The teacher gives each group of learners' specifications of different carving tools together with the advantages of each.
- *Phase 2* – Each group has to decide how to present the advantages of the carving tool.
- *Phase 3* – The teacher explains and writes up the rules for the debate: listening, not butting in, keeping eye contact etc.
- *Phase 4* – Each group has 5 minutes to decide how to use their tool and the others then have to work out what the advantages and disadvantages of it might be.
- *Phase 5* – The teacher chairs and opens the debate to the floor for questions. The teacher then employs teaching skills to ensure that every learner contributes.

Cooperative learning using scenarios

In cooperative learning, groups of learners work in small groups to maximise their own and each-others' learning. Derived from the work of Slaving (1995), the elements in the cooperative learning teaching model are: clear and positive interdependence between learners, face-to-face interaction, individual accountability, an emphasis on interpersonal and small-group skills, and group review to improve effectiveness.

The teaching model in this example has elements of cooperative learning and the strategy employed is the use of a scenario. The learning objective of the session is, for example, to use the information provided in a scenario to produce a typical risk assessment. As part of the context for this session, the learners are employed and the activity requires them to draw on their experience to identify the hazards in a furniture-manufacturing workshop.

Sequence of activities (syntax)

Phase 1 – The teacher introduces the session and provides a scenario of a workshop hosting a series of tools and machines in which there are many hazards.

Phase 2 – In groups of three the learners complete the first two columns of a chart – identifying what the hazards are, who might be harmed, and how. They draw on their own knowledge and experience to do this.

Phase 3 – Each group presents their findings in turn and they are all merged into a single composite document. By the end of the session, they have all contributed – each group providing something different or a new slant on things and the whole class has a detailed document.

The teacher’s role in this model is to set up the scenario and environment, then to guide the learners, who then take responsibility for working together and for each others’ learning.

Role-play

Role-play is a model that focuses on social interaction, improving social skills and developing a personal understanding of values and behaviour. Located in Joyce’s social family, the role-play model has its roots in both the social and personal dimensions of learning. The purpose of role-playing is to assist learners to understand an issue from different points of view by acting it out, either taking different roles or observing. It allows learners to look at a situation through someone else’s eyes, to take a different perspective and empathise. Role-play offers an effective way of exploring feelings, attitudes, values and solving problems. It actively involves learners’ and draws on their experiences.

There are nine stages in role play, as defined by Shaftel (1970): (a) warming up the group, (b) selecting participants, (c) setting the stage, (d) preparing observers, (e) enacting the role play, (f) discussing and evaluating, (g) re-enacting, (h) further discussion, and (i) sharing experiences/ generalisation. Each of these stages has a specific purpose that contributes to the richness and focus of the learning activity. According to Joyce et al (2000), role-playing provides an opportunity for ‘acting out’ conflicts, collecting information about social issues, learning to take on the roles of others, and improving learners’ social skills. The teaching model of role-play emphasises both intellectual and emotional aspects. The analysis and discussion following the role-play are as important as the role-playing itself.

The teaching model of role-play could be found in all the occupational areas; however, the model tends to be less employed in traditional furniture workshops.

The learning objective in the session used as an example below is to find out about quality assurance and the teacher uses the teaching model of role-play.

- Sequence of activities (syntax)
- *Phase 1* – The teacher uses PowerPoint slides to introduce the topic of quality assurance and the benefits of quality assurance followed by questions and answers.
- *Phase 2* – The teacher pairs the learners and gives them a card with a scenario on carrying out quality assurance of a product. The scenario requires one of the learners to be the employee and the other to be the customer. The teacher explains why the process is important and also the importance of writing things down formally. She defines what the roles are for the two people taking part in the role-play and gives clear instructions about who should be asking the questions and that feedback they provide should be constructive. The teacher shows another

PowerPoint slide with the rules for the quality assurance – that it should be motivational, positive and so on.

- *Phase 3* – All the learners carry out the role-play in pairs.
- *Phase 4* – The teacher gives a handout containing a quality assurance role-play checklist. There are two columns to it – one column involves questions for the employee and one for the customer. They include questions such as, ‘Did the customer check the quality of the product?’ ‘Did you feel satisfied?’ ‘Why?’
- *Phase 5* – The teacher asks the learners about the role-play, including how they felt about it.
- *Phase 6* – The teacher recaps on the session.
-

14.2 Teaching strategies

Strategies are the ‘tools for teaching and learning’ that teachers have available to them and ‘teaching skills’ are the ways in which teachers select and use the ‘tools’ at their disposal to achieve effective learning.

Teaching strategies are the tools that teachers have at their disposal to engage learners and enable learning objectives to be met via effective teaching and learning and teaching skills are how they select and use these strategies.

Teaching strategies are differentiated from teaching models by using our definition of a model as the sequence of steps or phases (the syntax) used to achieve particular types of learning outcomes.

The existing literature tends to divide the analysis of examples of skills and strategies observed in practice into the following three broad categories that follow the teaching and learning process. These are:

1. Planning and preparation
 - Strategies for differentiation
2. Managing delivery
 - Strategies of presentation and demonstration
 - Strategies involving technology
 - Strategies for group and individual learning
 - Strategies for reinforcing learning
 - Strategies for more effective learning
 - Using multiple strategies
3. Assessing learning
4. Strategies for assessing learning.

Planning and preparation

Duckett and Tartarkowski (2005) suggest that planning effective teaching and learning sessions should include the following processes: (a) specifying the aims and objectives or outcomes for the session, (b) showing how to review the previous session, (c) explaining the links to the current and next sessions, (d) identifying appropriate content, activities and strategies by which the learners will learn, (e) presenting strategies by which learning will be assessed, (f) selecting the resources, materials and media to support learning, and (g) considering how to summarise at the end of the session.

Differentiation is central in effective planning, ensuring that all learners can learn effectively and are sufficiently challenged. It is identified by LSIS as one of ten approaches to effective teaching and learning.

There is no single definition of differentiation, but all definitions are underpinned by a view of learners as individuals. Some approaches to differentiation suggest that differentiation needs to be considered at the planning stage of a session.

While the learning objectives and standards should remain the same, time and support given to learners by the teacher should be varied according to individual learner need. There are also the differences ways in which learners prefer to learn – visual, audio or kinaesthetic – that should be taken into account when using differentiation in the learning process. Understanding the different learning needs of individual learners, their strengths and weaknesses and how they learn best is of paramount importance to enable effective differentiation. Examples of differentiation utilised during the visits include:

- Advising and keeping learners on track by providing individual support, giving the weaker learners individual instruction and taking the stronger learners that bit further so they are not bored
- Providing the right amount of ‘stretch’ for individual learners while also managing the group
- E-learning activity allows for wide differentiation with, for example, board games acting as an alternative approach for learners who have not fully understood
- Using group and paired work, with careful selection of those who work together to enable different pace of learning as well as styles, ‘I wouldn’t generally pair a weak learner with a strong one but there are occasions when this can work with the stronger learner being a mentor and also learning more themselves through explaining to others’ selection of different resources to reflect the group and individuals within the group, taking account of the learner experiences.
- Using different forms of assessment to meet the needs of the learners: for example; written, filmed or recorded.

This following example illustrates differentiation in an ICT class and seeks to include everyone in the activity at their appropriate level of ability. It describes how a teacher sets a task allowing learners to choose how they wish to complete it according to their different levels of ability.

Strategies for giving information

Presentation

Presentation encompasses giving information in a number of ways, including:

- Teacher explanation often at the start of a session – ‘this is what we are going to do, these are the objectives for the session’
- Giving information/instruction and checking that learners understand by, for instance, use of questioning
- Clearly presenting information at the start of a session and then linking to other teaching strategies – presentation followed by immediate activity
- Guest speaker input – from the relevant vocational sector
- Providing information through different sensory modes: visual, audio, kinaesthetic
- Providing information through a variety of mediums – video, board, paper, work-book, actual demonstration, verbal explanation, questions and answers and practical activity
- Short PowerPoint or other computer-based presentations for information, recapping on a previous session, setting exercises or structuring a session.

Some teachers use PowerPoint presentations as a convenient way of structuring their sessions and as an *aide memoire* to ensure that they cover everything.

Slides cover the learning objectives for the session and instructions for tasks or activities and can be printed to give to learners during or after the session.

Demonstration

Demonstration has the added dimension of an explanation by example, a display of some sort – often accompanied by verbal explanation, though not always. It is usually important to follow the demonstration with a related activity. A teacher can use a variety of technological aids.

- Demonstration examples include:
- The physical demonstration of a skill such as holding and using a blow torch, or how to decommission and reassemble a computer
- A means of showing how something is done and that the tools being used are adequate for the job.
- Demonstration of an activity, showing how to develop a planning process – for instance, with a sample of what the end result could be like

- Using technology such as Moodle and/or Storyboard to show what is required as well as giving information to set the scene, and use of Smart Board to demonstrate tasks such as putting a joint together in construction.
- While showing the way to do something, ensuring that learners understand that there are different ways of doing things and that if the end result is successful then that is alright.

With demonstration, impact is an important factor: the following example as described by a senior manager shows how a simple demonstration can really help the learning process.

Strategies involving technology

Educational technology is the study and practice of facilitating learning and improving performance by creating; using and managing appropriate technological processes and resources.

Use of technology in the delivery of teaching and learning for any vocational area is increasing all the time. It is also one of the ten approaches described by LSIS as effective in promoting effective learning. Examples drawn from the literature include:

- Interactive whiteboards
- Computer(s) in each learning room for various uses
- Web pages for storing and accessing learner work
- Multimedia learning
- H5P: free and open-source content collaboration framework to make it easy for everyone to create, share and reuse interactive HTML5 content: Interactive videos, interactive presentations, quizzes, interactive timelines and more. To use HTML5 ensures that can be displayed by all LMS (Learning Management Systems) platforms independly of the operative system, device and the navigator.
- Moodle (Modular Object-Oriented Dynamic Learning Environment) providing an organised interface for e-Learning, or learning over the internet
- OPIGNO: Open Source e-learning platform based on Drupal (broad used Content Management System) that allows you to manage your online trainings, and efficiently ensure that student, employee and partner skills remain up to date.
- E-Learning through applied packages and on-line learning
- M-Learning – learning on the move including use of mobile phones
- IT-based packages for self-assessment
- Computer-generated quizzes and games
- Internet research
- Podcasts
- Mobile-phone technology

- Computerised tracking.

Learning organisations are changing at different rates. Some have utilised state-of-the-art technology, which has been useful in the engagement of learners, and some are lagging behind. Funding is one issue here, along with cultural change.

The learning materials developed within IMFUTURE contain English, Spanish and Italian all the training materials developed during this project:

The teacher can take this Platform as supporting tool for his/her teaching activity selecting the more according for his teaching activity.

The Platform supports mobile environments and it is prepared to contain future training materilas about design of products different from the furniture.

Strategies for group and individual learning

Teachers use their skills in deciding how to manage the learning process. This section includes activity-based learning using the strategies of working in pairs or with a peer, small-group work, whole-group work, and individual work. Many of the strategies described could be used within teaching models that focus on group and cooperative learning and belong to the 'social' group of teaching models. Group work and cooperative learning can shift the responsibility for learning from teacher to learner.

Pairs

Working in pairs is a valuable way of promoting good learning experiences operating along with a set of other ways of learning. Pairings can be learner-chosen, friend-orientated, random or chosen by the teacher related to abilities – both similar and diverse. For a role-playing session, the teacher picks the pairings having a good knowledge of the learners and enables effective pairings.

Pairing can be used to promote the development of communication and social skills as well as group cohesion as in this example of a plumbing session. Sometimes pairing a more able learner with a less able learner can benefit both, as can two learners that have complementary skills being paired.

Pairing can also be used to enable the development of other aspects of learning, such as attention to appropriate detail in planning. Peer explanation reinforces understanding of learning both for the recipient and the person explaining. It can really help some learners as a supplement to the teacher's information.

Peer help can also act as a role model in showing that something can be done – it provides motivation for others.

Small-group work

Splitting the whole group into smaller clusters can happen in many ways and is prevalent in vocational education. Apart from the curriculum learning aspects of group work there is also the valuable social interaction and motivation associated with working together. Small-group activities include:

- Production of a presentation with each person playing a part
- Putting together a piece of work, such as a questionnaire, or building something through group discussion to formulate ideas, decisions or content for pieces of work
- Groups competing against each other via quizzes, for instance, to promote learning during assessment
- Carousel activity where learners move from table to table
- Individuals coming together to complete a piece of work as a group
- Group work on a project followed by individuals then taking their version forward
- At the end of a session, reinforced learning via questions and answers.

This example illustrates the use of small-group work to make sure that everyone has all the information they need and interest and concentration is maintained.

- Role-play in small groups can be a useful learning tool to reinforce learning as explained in the example below. Role-play can also be used in a larger group with some observing and some playing their parts.

Whole-group work

Whole group activity can take many forms and includes:

- Discussion on a particular topic facilitated by the teacher, perhaps following a presentation or demonstration
- Debate carried out in formal debate mode or more informally
- Games (such as the domino illustration below)
- Whole group activity following individual, paired or small group activity to bring a topic/activity together: this might be individual research, for instance, followed by a whole-group debate activity where groups move around a space, for instance, moving to different corners of the room to answer questions or vote on a particular topic.

Carrying out a whole group activity can have advantages and disadvantages, as illustrated in the following example. Since all learners are working at more or less the same pace, it is easier to keep track of them and easier to control the group, but then some of the group may be relying on others

and it is harder to ensure that all have understood. The following example involves a game of dominos with each learner having one card carrying a word and a description of a different word. The idea is to link the dominos so that words and their descriptions are next to each other.

Individual work

Individuals carrying out learning on their own are often a part of many other ways of learning. For group learning, part of it will be a learner writing, carrying out research or reading. There might be individual work that is then swapped with another for paired work. Learners might complete an audit sheet as they carry out an individual task, such as installing software onto a computer.

Individual work can also replicate working in industry by carrying out a task alone. Learning carried out outside the classroom/workshop at home or in the library is often an individual task.

An example would be a computer-aided design (CAD) session where the learners work on their own to become familiar and expert at using CAD for drawing diagrams for construction. Although there would be some collaboration, it is essentially a solo task. Although links with employers can be a group activity, it is also something that learners can complete on their own. This enriches the learning and provides experience of working outside the classroom as well as offering an insight into how the industry works. In this example, an employer wants a web site designed and the teacher encourages the learner(s) to take the 'job' from start to finish, including the initial contact.

Strategies for reinforcing learning

Opportunities to practice-repetition

Practice and repetition help to ensure that the learning undertaken is remembered. Opportunities for this can be provided in different ways and include the examples below taken from the observations and interviews:

- Repetition of practice with regard to usage every time learners use computers
- Practice combined with questioning to memorise information about, for instance, 49 countries for a furniture history unit
- Facilitating discussion to ensure that everyone understands what they are doing and how they can go back to an example to assist them if they get stuck
- Learners writing about what they have achieved to show that they understand what they have learned and recognise the importance of being thorough when, for example, writing a plan and being able to follow instructions
- The teacher checking on each learner as they progress: each time there is a repetition task, the learner should need less intervention
- Referencing back to objectives to reinforce learning
- Recapping sessions at the end of lessons to see what knowledge has been retained

- Weekly recapping to make sure of correct understanding – through Moodle, for example – by creating crossword questions, automatic marking, and an assessment grid to show individual progress.

Questioning

Effective questioning can be used to reinforce learning and includes a combination of low-level and high-order questions for deeper learning and can be used to keep learners at work and to check their understanding (Redfield and Rousseau, 1981). Examples of questioning drawn from the fieldwork visits include:

- Use at the beginning of a session and throughout to ascertain prior knowledge and links to advance organisers
- Use to check understanding and identify who is not fully engaged with the task
- Use to encourage evaluation by learners of their work and their learning, through the use of appropriate questions applied in a variety of forms; mainly open – and not just superficial but going beyond the initial response to probe deeper
- Use to check understanding by returning to a learner who may not have fully understood previously in response to questions asked: the teacher does not supply the answer, but challenges the learner to work it out – involving other learners to supply the answer if appropriate.

For questioning, it is helpful to involve all learners, not just the assertive and self-confident who want to answer the questions all the time. Sometimes learners will want not to offer an answer when they may be uncertain. One teacher solved this issue by using learners to nominate someone to answer the next question. Questioning can be used in an elimination strategy so that learners move towards the right answer.

Strategies to develop learning skills

Assisting learners to become more effective learners, to ‘learn how to learn’, enables them to learn knowledge and skills more efficiently – a valuable skill in itself for life. Active control over the thinking processes involved in learning is referred to as metacognition. Activities such as planning how to approach a given learning task, monitoring comprehension, and evaluating progress toward the completion of a task are metacognitive in nature. Because metacognition plays a critical role in successful learning, it is important for both learners and teachers. Metacognition is often referred to as ‘thinking about thinking’ and can be used to help learners to ‘learn how to learn’. In some interviews, teachers explicitly described their intention to develop higher-order thinking skills.

If the culture of the organisation in which learning takes place systematically cultivates habits and attitudes that help learners to be confident of their own learning ability and to be creative, then learners are likely to learn faster, concentrate more, be more resourceful, more imaginative and more collaborative, so learning can become more enjoyable. Activities that encourage effective learning and higher-order thinking include:

- Asking questions that encourages the development of imagination
- Evaluation activities
- Researching to prepare for an assignment, particularly with peers
- Tasks in which learners need to reason and apply learning in a way that requires higher-order thinking
- Considering new information and making sense of it
- Investigative and experimental tasks
- Taking part in role-play sessions – looking at it from another person’s point of view
- Simulations to give experience of work situations
- Adopting step-by-step approaches – building one-step at a time cumulatively.

In order for learners to become more effective and develop higher-order thinking they need to be exposed to activities such as research and analysis.

Assessing learning

Assessment can be either ‘for’ or ‘of’ learning and both types of assessment are evident in the existing literature.

Assessment ‘of’ learning can take a number of forms and may depend on the curriculum design and/or delivery methods. It includes self-assessment, peer assessment and teacher assessment by using questions, paper-based or computer-generated tests, demonstrations, or games. Assessment methods are not always under the control of the teacher as they might be specified by the awarding organisation.

Assessment ‘for’ learning is recognised as an effective way of assessing that also contributes to learning. Assessment is: ‘about assessing progress and analysing and feeding back the outcomes of that assessment positively and constructively to agree actions to help the learner improve and adapt teaching methods to meet the learner’s identified needs.’ (QIA 2008). Ten principles of assessment for learning have been identified as being: (a) part of effective planning, (b) focused on how learners learn, (c) central to classroom practice, (d) a key professional skill, (e) sensitive and constructive, (f) capable of fostering motivation, (g) a promoter of understanding the goals and criteria, (h) an assistant for learners to know how to improve, (i) a developer of capacities for self-assessment (and peer assessment), and (j) a recogniser of all educational achievement (DfES 2002). It is about the teacher and the learner working together to assess progress and contribute to effective learning.

In practice, teachers tend to use a variety of methods of assessment including:

- Assessment as a learning tool – assessment for learning
- Self-assessment and teacher evaluation/feedback with assignments written on Moodle or OPIGNO, avoiding too much paperwork and automatically generating an achievement grid for learner/teacher assessment of progress, and hence feedback

- Self-assessment of understanding through the traffic-lights method
- Checklists to self-assess
- Peer feedback to provide assessment
- Workbooks
- Mock tests
- Quizzes, crosswords and games as sources of fun
- Learners being empowered to choose their own assessment format.

Different modes of testing keep the learners interested, as does the use of incentives.

Teacher reflection

Teacher reflection is a three-fold process comprising direct experience, analysis of beliefs, values or knowledge about that experience, and consideration of the options that should lead to action as a result of the analysis.

As work progressed against the framework, it became clear that there was one additional, distinctive feature that in part defined vocational learning and that was the context within which it takes place. Effective teachers are reflective; they constantly review their practice, discuss it with their colleagues, consider their learners' responses and seek to develop new and better ways of teaching. The concept of reflective practice was introduced by Donald Schon (1983) and given currency by Kolb (1984) in his experiential learning theory. It involves thoughtfully considering one's own experiences as one makes the connection between knowledge and practice, under the guidance of an experienced professional within a discipline (Schon, 1996). Moon (1999) defined reflective practice as 'a set of abilities and skills, to indicate the taking of a critical stance, an orientation to problem solving or state of mind.' In essence, it is a readiness to constantly evaluate and review one's practice in the light of new learning (which may arise from within the context of professional practice). After its introduction, many VET organisations started to incorporate reflective practice into their educational and professional development programmes. It was evident from practitioners in this study that reflection was an important and well-established part of their professional practice.

Examples are provided of reflective practice in terms of responding to learner feedback, improving practice through personal reflection and sharing with colleagues to improve practice. Teachers used a number of different ways of developing their repertoire of skills. These included: learning from experience, observation of teaching, as well as learning from the support of colleagues.

Reflective practice

There was considerable evidence from observations and interviews that good teachers are always learning, building their own skills and teaching themselves. They undertake lots of research to inform their planning and delivery. They are self-critical, recognising when things do not go well, trying to understand why, and formulating ideas about how to improve.

Teachers evaluate their practice and reflect on how they might improve aspects of their sessions. They reflect on the way that they teach something so that they do not necessarily just teach it the way they were taught but think about how it might be improved.

Responding to learner feedback

The importance of learner feedback is evident from the literature with examples of teachers sharing practice with colleagues and collecting and using learner feedback:

It is experience really and assistance from my colleagues. You need to exchange practices so you do not stagnate to the same routine. I also give feedback sheets to students. I want to see through their eyes because sometimes as teachers we think of how we want to learn or what we would like but that doesn't mean that this is what the students like. Some approaches might suit me but that doesn't mean that they suit them.

Feedback from students

It is reaction from students that is important. You can walk out of a class and think to yourself: "that was brilliant but the students didn't think it was brilliant, so it's not brilliant". The students are your judges so if students are enjoying it and they're taking part, they're keen, they're answering questions, then you can say it's reasonably successful, you've achieved what you need to achieve.

If they're not, then there's an issue and one has to think of other ways. This teacher also reflected on the session from a learner's perspective, asking questions such as: "If I was a learner in that lesson, how would I have assessed it? Would I have enjoyed it? Would I have been interested throughout?"

Teaching context

Teaching context covers a mixture of elements and includes the nature of the vocational subject, the setting where teaching and learning takes place, the objectives and desired outcomes for a session, plus specifications of the qualification, the nature of the learners, their level, and how they learn best – including their learning styles. Context is such an important factor in vocational learning that it warrants separate consideration. Vocational context is largely responsible for defining the nature of the learning that will take place. Consequently this new (fifth) component emerged to add to the Framework.

The literature in this area refers to context and its importance in vocational learning. In a recent publication, the Institute for Learning stated that brilliant teaching and training comes from the combination of a deep understanding of learning and the use of 'learning to learn' strategies applied within the context of a vocational subject and workplace setting (IfL, 2010). Kerka also commented on the importance of context on the effectiveness of learning, 'other key features of knowledge construction are: (a) functional context, (b) social context, and (c) usefulness. The process works most effectively when it is embedded in a context in which knowledge and skills will be used.' (Kerka, 1997). Other research findings support the value of contextualised learning that provides opportunities for knowledge acquisition and construction, practice and reinforcement, in 'natural settings', such as the workplace (Billett, 1993).

The concept of situated learning, developed by Lave and Wenger (1991), that ‘knowledge is created and made meaningful by the context in which it is acquired’ (Farmer et al., 1992), is deeply embedded in work-based vocational learning and in teaching models derived from constructivism. Two basic principles underlie situated learning. First, knowledge needs to be presented in an authentic context: i.e., in the setting where knowledge would usually be applied. Second, learning requires social interaction and collaboration: context is a broader concept.

In addition to the setting or location where the learning takes place, we include within this context:

- Learning objectives and desired outcomes for a session or part of a session;
- Nature of the learning such as the vocational subject area, and whether is it theoretical or practical;
- Level of the learning;
- Specification and requirements of the qualification or course;
- Nature of the learners: how they learn best, including their learning styles or any particular difficulties they might have in learning;
- Composition and size of the group of learners and the learning environment, including the resources and facilities available.

Analysis of trainers’ needs

VET aims at preparing learners effectively for real workplaces, which means that the acquisition of competences should take into account the requirements of companies and industry. It is now widely accepted at a European level that VET should be competence-based. Competence-Based Education and Training should enable employees not only to increase their knowledge and skills at the workplace, but also to gain nationally accredited certificates for workplace-based learning. The self-paced and flexible structure of CBET programmes should encourage learners to become responsible for their individual learning process. The modular structure allows for individual combinations of competences limited only by certain ‘packaging rules’, which refer to accredited national vocational qualifications.

The purpose of nationally endorsed competence standards being at the core of CBET is on the one hand to transform the requirements of industry and enterprises into the world of learning. On the other hand, standards provide transparency of competences underlying vocational qualifications.

Competence-Based Education and Training (CBET) is an approach to VET, in which skills, knowledge and attitudes are specified in order to define, steer and help to achieve competence standards, mostly within a national qualifications framework. Deisingler, (2011,p.6) defines CBET as “a way of approaching (vocational) training that places primary emphasis on what a person can do as a result of training (the outcome), and as such represents a shift away from an emphasis on the process involved in training (the inputs). It is concerned with training to industry specific standards rather than an individual’s achievement relative to others in the group”. Six criteria are currently used to describe the typical structure of CBET programmes. These criteria specify both the micro-structure of CBET (i.e., its learning and assessment dimension), and the macro-structure (i.e., its institutional framework).

Outcome criterion

Persons demonstrating all prescribed competences in an accredited course or training programme should obtain a credential or statement of attainment that is recognised within the national framework. Reports of competences gained should be provided to learners. Reporting may be in terms of completed modules provided that the relationship between competences and modules is understood. The course is recognised to meet national competence standards that have been endorsed by a national authority. In the absence of national standards, course outcomes should be based on the authority's definition of competence and endorsed by industry training boards or by relevant industry parties where industry training board coverage is not appropriate.

Curricular criterion

The curriculum gives learners a clear indication of what is expected of them in terms of performance, conditions and standards. Also, if appropriate, subsequent workplace and off-the-job training and assessment responsibilities should be identified.

Delivery criterion

Delivery is flexible and learners can exercise initiative in the learning process. Learning materials used by providers indicate the degree to which programme delivery is learner-centred.

Assessment criterion

Assessment should:

- Measure performance demonstrated against a specified competence standard;
- Be available for competences gained outside the course;
- Include workplace or off-the-job components if appropriate.

Reporting / recording criterion

Reports of competences gained should be provided to learners. Reporting may be in terms of completed modules provided that the relationship between competences and modules is understood.

Certification criterion

Persons demonstrating all prescribed competences in an accredited course or training programme should obtain a credential or statement of attainment that is recognised within the national framework.

14.3 Methods and tools for the delivery of the content through the IMFUTURE Platform

A literature review conducted informs the delivery of the Master's content, revealing the following:

1. Teaching and learning is a highly complex process and effective practice results from a complex interaction of factors.

2. There is little evidence that vocational teaching and learning is fundamentally different from any other type of teaching and learning except in one respect – that of context. Given the importance of context, a new Framework was developed from that of Hopkins (2007), to include ‘context’ as a separate, specific component. These five interrelated and overlapping components in the Framework must work in synergy to provide effective teaching and learning that meets the required learning objectives and learning outcomes.
3. There are many examples of effective practice in vocational teaching and learning.
4. Teachers believe that in many cases, practice is directly transferable from one vocational area to another.
5. Teachers indicate that they also vary their practice, for example, in response to the different levels of the programmes and abilities of learners.
6. Vocational teaching and learning is underpinned by some learning theories – experiential learning and learning styles theories being the most prevalent.
7. Teachers draw extensively on their own experiences and those shared with colleagues.
8. Teaching relationships were identified as crucially important.
9. Teaching models did not appear to be used intentionally in a planned and systematic way by teachers when deciding how to teach.
10. Teachers use their skills to choose from a very wide range of strategies. These include strategies for: differentiation, presentation and demonstration, using technology, group and individual learning, reinforcing learning and assessing learning as well as the use of multiple strategies within a session.
11. In the very best sessions, teachers tend to have high aspirations and seek to stretch their learners. They plan to develop a range of learners’ skills beyond just mastering a particular skill or acquiring information to meet a course or qualification specification. These skills include higher-order learning and thinking skills (such as ‘advance organisers’ and learning to learn), social and interpersonal skills to communicate effectively and employability skills. These are consistent with the skills for the 21st century.
12. Effective teachers are reflective; they constantly review their practice, discuss it with their colleagues and seek to develop new and better ways of teaching.

In the context of training-material provision for a Massive Online Open Course (MOOC) framework, the following pages supply an outline for a core philosophy in the delivery of content. A MOOC could and should be much more than a traditional course delivered online. Packing face-to-face classes to an online system does not make sense from a pedagogical perspective.

A long tradition and successful experience coming both from the educational technology and distance-learning fields should be taken seriously and as a source of inspiration. Considering the diverse learning modes, ranging from face-to-face to fully online, (Guàrdia, 2012; Bach, Haynes, & Smith, 2007; Bates & Poole, 2003), it is possible to conclude that there is a considerable number of identifiable online

delivery models in education, and that MOOCs are just one more possibility in the application of ICT. It is also possible to situate MOOCs at the far right end of the online learning continuum.

Aligned with the continuum classification, Hill (2012, p. 86) contextualizes MOOCs within a “landscape of educational delivery models” considering the role of the educational technology and instructional design. Researchers and experts in this field are discussing the best pedagogical approach to MOOCs. The text below tries to address some key questions regarding the value of MOOC’s beyond a massive and open delivery.

The previous MOOC distinction is somewhat forced to trigger the inherent differences. In fact, as Lane (2012) remarks, a MOOC usually manifests tendencies that put an accent on the network, the content, or the tasks. In all cases, massiveness and low-teaching involvement during delivery stages is one the biggest challenges for a MOOC.

Here are ten key elements that should be taken into account by those involved in teaching a MOOC.

1. Competence-Based Design Approach. CBDA focuses on outcomes of learning and addresses what the learners are expected to do rather than what they are expected to learn about (Richards & Rodgers, 2001). Learners need to learn in ways that can develop their capacity to solve situations that are commonly encountered in everyday life. This is best achieved by including contextual variation, situating learning as part of the learning experience, through Simulations, Problem-based learning, Case-based learning, and Project-based learning. Through this kind of activities, learners should develop the competences better than by passively reading a large amount of text-based documents or watching and listening to traditional video lectures and testing comprehension.
2. Learner Empowerment. Online learners’ attention is much more demanding, and what works for campus teaching does not (usually) replicate in networked spaces. Regressive pedagogy (Siemens, 2013) is abundant in MOOCs that emphasises a teacher-centred approach difficult to transpose into online learning environments. Recorded long-lasting master classes underestimate the potential of technologies and inhibit interaction. The video technology could be used for broadening communication opportunities and for encouraging learners’ expression. MOOC design should privilege a Learner-Centred Approach, providing strategies that change the perception of learners as active participants in the establishment of individual goals and a personal trajectory. Self-regulation, self-pacing, and self-assessment together with peer support and the formation of interest groups promote student empowerment and engagement.
3. Learning plan and clear orientations. Planning is crucial in a MOOC. As the heterogeneity of students is high, their level of maturity and experience is also varied. At the beginning, it is good practice to give the learners a study plan accompanied with detailed templates for the developing of activities. Clarify milestones and compulsory activities, providing a well-developed schedule with tasks, assignments and deadlines. Use a friendly tool easy to integrate with the student digital agenda that provides a suggested pace for learning, with a detailed description of tasks and subtasks and their estimated time. Suggest clues

on how to cope with incidentals and plan for contingency (peer assistance, revision of personal goals and expectations, revision of personal planning and agenda). Do not forget to add criteria for assessment and avoid relying exclusively on multiple-choice tests.

4. Collaborative learning. Design for collaborative learning including teamwork activities and discussion forums. Allow the addition of exchange spaces for and by students. Provide clear 'netiquettes' for participation in discussion forums or any other collaborative activity. Establish rules and parameters about quality and extension of course production and interventions. Foster this collaborative approach by designing and promoting activities and tasks in which collaboration is a must or an added value.
5. Social networking. Social aspects should not be neglected. They are at the source of group formation and the establishment of durable peer cooperation. Set up a space to foster social interaction and frequent contact between the learners. To promote a 'feed forward' attitude of sharing the work with other learners, and facilitate exchange, create a course hashtag for social applications like Twitter, and social bookmarking like Diigo. Provide guidance on social and open tools and strategies that help learners to create their own personal learning environment (PLE), with content aggregators, mashups, personal blogs, and learning communities to keep a permanent connection with the network.
6. Peer assistance. The notion of 'paragogy' relates to peer production environments (Corneli & Danoff, 2011), including the co-creation of ad-hoc spaces for dialogue and support. The MOOC design should make explicitly mention the value of peer assistance through commenting and social appraisal. It should provide guidance on 'how much' the student should read contributions by others and explain a strategy for filtering course-generated information both individually and automatically. Even hints on how to present better the generated information to others by using – for example – descriptive titles that help the other participants to decide if they want to read it. These can be exemplified by learners as useful tips.
7. Quality criteria for knowledge creation and generation. The notion of Learner Generated Content (Perez-Mateo, Maina, Guitert, & Romero, 2011) is associated with learner outputs in Web 2.0 and networked environments. Establish in a MOOC the value of informed but personal views on topics and how they contribute to knowledge construction. Show how original content is appreciated, providing quality criteria for content development and content selection. Differentiate 'brainstorming' and 'exploratory' tasks from final activities. Promote critical thinking giving value to the creation of good questions and not only to finding answers.
8. Interest groups. Provide opportunities for small-group discussion and exchange. Recommend small-group focused discussions. Give hints on how better to organise groups and subgroups according to their interest. The 'crowd' participation in a MOOC enables the formation of sub-networks based on interests, culture, geography, language, or some other attribute that draws individuals together (Siemens, 2013). Once a group or subgroup is formed, each member should be assigned a role. To assist group creation and cohesion,

establish a social learning environment and promote 'extended' presentations. This could keep motivation alive and avoid learners losing interest before dropping out.

9. Assessment and peer feedback. Building trust in self- and peer-assessment can be addressed by elaborating objective and precise criteria and explanation. The design of rubrics, scales, and explanatory automatic answers are supportive tools for the learner. Furthermore, give clues on how to collect learning evidence and organize them to provide accountability of learning trajectories. Suggest the use of a blog or e-Portfolio applications for collecting, reflecting, annotating and sharing the learning outcomes and further reflections.
10. Media-technology-enhanced learning. Making appropriate use of media is the result of informed decisions on technology (Laurillard, 2002). Offer learners a variety of rich-media for capturing their attention and retention. On the other hand, in order to improve the quality of production by learners and to support engagement, provide guidance on how to determine best media choices according to each intention. Confront them to the abundance of applications and encourage the exploration of new available tools that support rich interactive and highly audio-visual content.

At present, most MOOC discourse reflects strategic, institutional, economic, social and technological concerns. A deep pedagogical debate is still missing. These ten points introduce a set of design principles drawn from the perspective of the learner.

According to existing literature, MOOC participants put forward in their reflections and comments thoughtful accounts of their learning experience and useful recommendations for improvement that comprise strong pedagogical considerations, such as:

Empower learners with networked learning strategies that foster critical thinking and collaboration. This requires putting the learner at the centre of the process while providing adequate learning contexts, methods and tools that enable the development of targeted and self-traced competences. It includes scaffolding regulatory evidence on outcomes by well- developed assessment strategies combined with criteria-based rubrics for self- and peer-evaluation.

Ensure teacher presence (Anderson, 2008) not only as a referent or expert in the field, but through the course design. Teacher-mediated presence should be tangible through a detailed study guide, a set of meaningful learning activities, a collection of interactive resources, and supplementary recommendations on how to organise the social interaction. The learning scenario should be deployed to include descriptive learning tactics on how to navigate, organise, and participate in a new global learning scenario.

15 Ensure open licenses OER for training materials

The results of the IMFUTURE project will be uploaded onto the project website where the different teaching and learning materials will be available to download. This section of the website will be open-accessed and teachers and learners will have free access to download tutorials, good practices

manuals, etc. The consortium has decided that the full access to the materials will need a previous login. CETEM will manage the user administration to give future permissions.

Each of these digital materials will be open licensed and so will avoid the automatically applied copyright restrictions. The aim to open-licence the work and results of the project is also to spread the reach and recognition of the authors. From the organisations perspective, the resources are potentially exploitable for obtaining commercial benefits and thus the partners will have all-rights reserved as copyright. The organisations and the authors will be able to market these resources in the future, ensuring that it remains attributed to the original author after the content has been shared. This does not mean that the partnership will actively market the resources, it will mean that the intellectual property rights (IPR) of the partners and authors are protected.

By sharing of the digitalised materials between students and the institutions under this licence, the content will remain attributed to the original author. The intention of others to plagiarise the source materials will be reduced because they will have permission to use them under open source licence. ICTs will be essential for sharing the educational materials. Within the e-learning platform (IO3) a separate section for uploading the contents will be defined. In this open-access section teachers and learners will be able to download resources such as:

- Text: Teaching tutorials, best practices tutorials, modules content, templates, exercises, etc
- Images: Logos, photographs, diagrams, etc
- Video: Video Tutorials, animations, etc
- Audio: Audio-Tutorials, music, etc

All of these contents will have the most used multimedia formats like: DOC, TXT, PDF, HTML (for text); PNG, JPG, PDF (for images); WAV and MP3 (for audio); AVI, MP4, MPG (for video). Using these formats will make access simpler for users. This will include consideration of accessibility issues to ensure no users are discriminated against. In order to achieve the best practice for accessibility we will follow European legislation. **The selected alternative licensing has been Creative Commons (CC)¹**. These licenses have the aim of sharing and reusing the created work under some special conditions. The author authorises the use of their work, but it is protected and authorship is recognised. For every material this type of the CC license will be chosen. The options for the CC are:

1-Allow adaptations of your work to be shared:

A-Yes

B-No

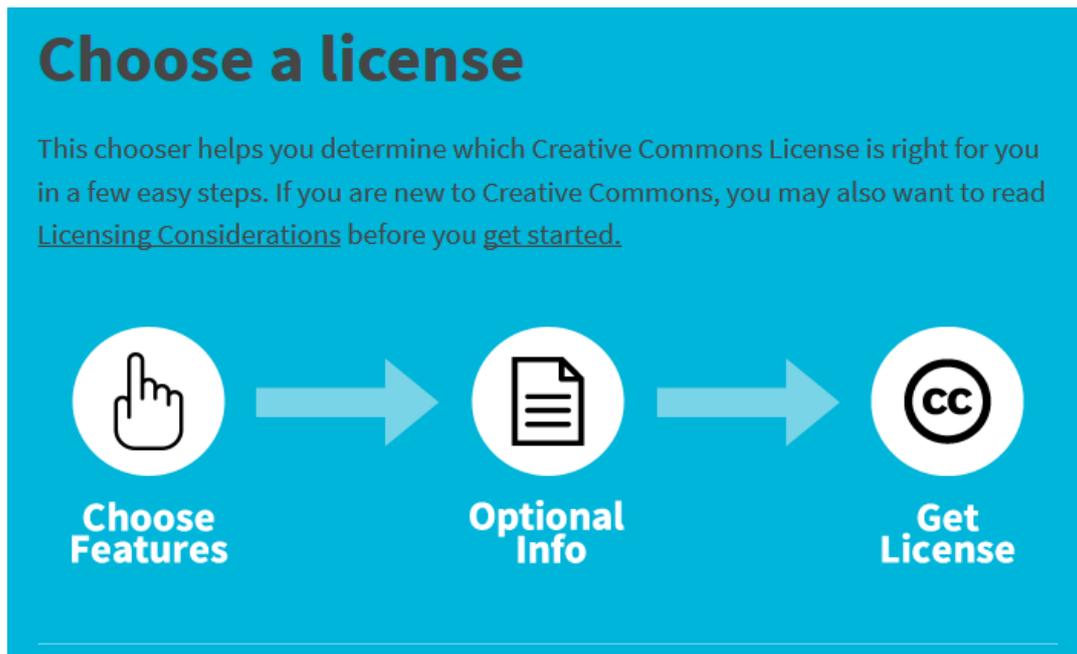
C-Yes, as long as others share alike

2-Allow commercial uses of your work:

A-Yes

B-No

¹ <https://creativecommons.org>



Taking into account all these possibilities, the author will be able to choose between 6 types of licences, depending on the needs of the organisation, the kind of material, etc. The best way of ensuring that the author will be remunerated is **excluding commercial uses and adaptations**. This is "Attribution Non-Commercial No Derivatives". The author has the right of the exploitation of their work whenever they are considered. Also, the authors will be able to exploit it with a different kind of license (CC or other) or even to retract it (but the original CC license will still be valid).



Figure. Icon for the select CC selected license

The training materials were protected under Creative Commns Attribution-NonCommercial-ShareAlike 4.0 International. The user is free to:

- **Share** — copy and redistribute the material in any medium or format
- **Adapt** — remix, transform, and build upon the material

The licensor cannot revoke these freedoms as long as you follow the license terms. The materials are protected under the following terms:

- **Attribution** — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
- **NonCommercial** — You may not use the material for commercial purposes.
- **ShareAlike** — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.

The consortium has used their know-how and expertise in the field of furniture design and applied arts to develop the training materials. Nevertheless, reference to other sources (text, images, etc) have been used to develop ARTURE course. The consortium has agreed to use Harvard Referencing Bibliography² to reference those sources.

16 References

Anderson, T., (2008). *The theory and practice on online learning* (2nd ed.). Issues in Distance Education Series (electronic version). Athabasca University, Canada: AU Press

Bach, S. & Haynes, P. & Smith, J. L., (2007). *Online learning and teaching in Higher Education*. London: McGraw-Hill

Ballantine J. and McCourt Larres P. (2007). 'Cooperative Learning: A Pedagogy to Improve Students' Generic Skills?', *Education and Training*. Vol. 49, Iss. 2, pp.126–137.

Bates, A. W. & Poole G., (2003). *Effective teaching with technology in Higher Education: Foundations for success*. San Francisco: Jossey-Bass.

Billett S. (1993). 'What's in a Setting? Learning in the Workplace', *Australian Journal of Adult and Community Education*. No. 1 (April 1993) pp 4–14.(EJ 464 971).

Creemers B. P. M. (1994). *The Effective Classroom*. London: Cassell

² <http://www.citethisforme.com/harvard-referencing>

- Colley H., James D., Tedder M. and Diment K. (2003). 'Learning as Becoming in Vocational Education and Training: Class, Gender and the Role of Vocational Habitus', *Journal of Vocational Education and Training*. Vol. 55, Part 4, pp.471–498.
- Deissinger, Th. (1996). Germany's Vocational Training Act: Its Function as an Instrument of Quality Control within a Tradition-based Vocational Training System, in: *Oxford Review of Education*, vol. 22, pp. 317–336.
- Deissinger, Th. (2004). 'Apprenticeship Systems in England and Germany: decline and survival', in: Greinert, W. - D. / Hanf, G. (eds.), *Towards a History of Vocational Education and Training (VET) in Europe in a Comparative Perspective*. Proceedings of the First International Conference, October 2002, Florence, Vol. I (CEDEFOP Panorama Series, No. 103), Luxembourg (Office for Official Publications of the European Communities), pp. 28–45.
- DfE (2010). *Participation in Education and Training of 16–18 year olds by Highest Qualification Aim and Institution Type, and Work-based Learning*, England, 1985 Onwards.
<http://www.education.gov.uk/rsgateway/DB/SFR/s000938/sfr18-2010ratesv2.xls>
- DfES (2002). *Assessment for Learning: 10 Principles*. National Strategies Assessment Reform Group
- DfES (2004). 'Pedagogy and Practice: Teaching and Learning in Secondary Schools Unit 2'; *Teaching Models*.
http://webarchive.nationalarchives.gov.uk/20100612050234/http://nationalstrategies.standards.dcsf.gov.uk/node/95448?uc=force_uj (accessed 23.07.17)
- Duckett I. and Tatarkowski M. (2005). *Practical Strategies for Learning and Teaching on Vocational Programmes*. Vocational Learning Support Programme 16–19. London: Learning and Skills Development Agency.
- Ertl, H. (2000). *Modularisation of Vocational Education in Europe. NVQs and GNVQs as a model for the reform of initial training provisions in Germany?*, Oxford (Symposium Books).
- European Commission (1995). *White Paper on Education and Training: Teaching and Learning – Towards the Learning Society* (November 1995), Brussels (European Commission).
- Farmer J., Buckmaster A. and Legrand Brandt. (1992). 'Cognitive Apprenticeship.' *New Direction in Adult and Continuing Education*. No. 55 (Fall 1992) pp. 41–49. (EJ 456 732).
- Field S., Hoeckel K., Kis V. and Małgorzata K. (2009). *Learning for Jobs: OECD Reviews of Vocational Education and Training Initial Report*. www.oecd.org/dataoecd/36/24/43926141.pdf
- Gonczi, A., Hager, P., Oliver, L. (1990). *Establishing Competency-Based Standards in the Professions*, Canberra
- Guàrdia, L., (2012). 'El diseño tecnopedagógico del ePortfolio para contextos de enseñanza y aprendizaje en la educación superior: desde una visión evolutiva de los modelos de educación a distancia a la educación en línea'. [Higher Education ePortfolio design: an evolutionary visión from ODL to online learning]. (Unpublished doctoral dissertation). Euskal Herriko Unibertsitatea, San Sebastián.
- Guthrie H., Harris R., Simons M. and Karmel T. (2009). 'Teaching for Technical and Vocational Education and Training (TVET)'. *International Handbook of Research on Lecturers and Teaching*. Vol. 21, Iss.10, pp. 851–863.
- Hattie J. A. C. (2009). *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement*. London: Routledge
- Hill, P., (2012). *Online educational delivery models: A descriptive view*. *Educase Review*, 6, 85-97.
- Hopkins D. (2007). *Every School a Great School*. Maidenhead: McGraw Hill/Open University Press.
- Institute for Learning (2010). *Brilliant Teaching and Training in FE and Skills: A Guide to Effective CPD for Teachers, Trainers and Leaders*.
http://www.ifl.ac.uk/__data/assets/pdf_file/0011/16400/IfL2010-BrilliantTeachingAndTrainingGuide.pdf (accessed 18.07.17)
- Ji-Ping Z. and Collis B. (1995). 'A Comparison of Teaching Models in the West and in China'. *Journal of Instructional Science and Technology*. Vol. 1, No. 1, Article 3.
<http://www.ascilite.org.au/ajet/e-jist/docs/vol1no1/article3.htm> (accessed 19.06.17)

- Joyce B., Weil M. and Calhoun E. (2000). *Models of Teaching* (6th edn.). Needham Heights, MA: Allyn & Bacon.
- Kerka S. (1997). *Constructivism, Workplace Learning and Vocational Education*. ERIC Digest No. 181
- Kolb D. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. London: Kogan Page.
- Lane, L., (2012, August 15). 'Three Kinds of MOOCs'. Retrieved from: <http://lisahistory.net/wordpress/2012/08/three-kinds-ofmoocs/>
- LSN (2006). 'Learning Styles for Vocational Teaching and Learning'. LSIS Excellence Gateway. <http://www.excellencegateway.org.uk/VLSP-13112>
- Marzano R. J. (1998). *A Theory-based Meta-analysis of Research on Instruction*. Aurora, CO: Mid-continent Research for Education and Learning. www.mcrel.org/pdf/instruction/5982rr_instructionmeta_analysis.pdf
- Moon J. (1999). *Learning Journals: A Handbook for Academics, Students and Professional Development*. London: Kogan Page.
- Ofsted (2009). *Common Inspection Framework for Further Education and Skills 2009*. Manchester: Ofsted.
- QIA (2008). 'Guidance for Assessment and Learning'. http://sflip.excellencegateway.org.uk/pdf/4.2sflguidance_5.pdf
- Petty G. (2009). *Evidence-Based Teaching: A Practical Approach*. (2nd edn.). Cheltenham: Nelson Thornes Ltd
- Rauner F. and Maclean R. (2008). *Handbook of Technical and Vocational Education and Training Research*. Dordrecht: Springer.
- Siemens, G., (2012, July 25). 'MOOCs are really a platform'. eLearnSpace. Retrieved from: <http://www.elearnspace.org/blog/2012/07/25/moocs-are-really-a-platform/>
- Slavin R. E. (1995). *Cooperative Learning: Theory, Research and Practice*. (2nd edn.). Boston: Allyn & Bacon.
- Smith R. M. (1982). *Learning How to Learn: Applied Theory for Adults*. Chicago: Follet.
- Smith, E., Keating, J. (2003). *From Training Reform to Training Packages*, Tuggerah NSW (Social Science Press).
- Teaching and Learning Research Programme and Economic and Social Research Council (2006). *Improving Teaching and Learning in Schools*. London: Institute of Education.