



# Output IO2A1

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## TRAINING PATHS DEFINITION

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**Innovative Training Approach in the Technology Assisted Environment for Water**

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### PARADOX CONTACTS:

clara.cordon@upm.es

### AUTHORS AND AFFILIATION:

José Luis García Rodríguez, Clara Cordon, Martín Cruz Giménez

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# 1 THE AIM OF THE PARADOX PROJECT AND THE LEARNING PROGRAMME

The field of Higher Education has been recognised as one of the key drivers within the EU2020 Strategy to overcome the socioeconomic crisis, to boost growth and jobs and to foster equity and inclusion. Moreover, one of the key priorities for HE is the reinforcement of the “Knowledge Triangle”, through the support of innovation, entrepreneurship, and university-business cooperation. This specifically applies to those traditional sectors, such as the environmental-related sectors, where changes in education and training are required to equip the future workforce with the new skills for the new demands generated by the changing patterns of economic growth as a result of climate change (e.g.: water sources, tourism impact).

Nevertheless, the European Security and implicit of its Water Sources is a key driver of sustainable growth with a significant contribution to Europe ‘s overall economic health, competitiveness, creativity, innovation, employment, and growth. Staff qualifications along youth unemployment remain one of the crucial points in Europe. To boost the recruitment of highly prepared staff requires initiatives addressing training to make the sector attractive and capable of transforming both the academic knowledge and high-level basic and transversal competencies required to be useful and applicable.

For these reasons, this Strategic Partnership proposes the creation of a flexible learning pathway in line with the needs of learners and companies in meeting environmental targets and securing sustainable conditions for EU citizens. It provides a joint study modules program between Higher Education and Vocational Education and Training that capitalise companies with prepared youth, providing enterprises innovation, expertise, and added value.

The aim is to develop an International Master’s Degree Modules Programme for the Climate Change and Water Security in Europe, which will offer an adapted curriculum to equip the young generation with the specific, basic, and transversal competences currently required in the related industries. This international Master's Degree modules will provide students with opportunities to gain additional skills by studying and training abroad.

PARADOX arises from a Strategic Partnership composed of seven entities from regions that are highly influenced by climate change and tourism impact: Five universities and three SMEs /technical research and training centres.

The consortium developed a Study Report on current skills needs on the European Environmental studies offer a Joint Modules Curriculum together with learning content and an e-Learning platform that will be freely and widely distributed. 6 Multiplier Events are planned at the end of the project.

PARADOX contributes to the modernisation and reinforcement of education aligned to the needs and opportunities offered by traditional industries.

The project provides, assesses, and look for the recognition of basic skills needed in the environmental-related sectors. PARADOX also address transversal skills, such as entrepreneurship, foreign languages and digital competences. HE students and staff, and also everyone involved in the development of this initiative will have the chance of increasing their sense of initiative and entrepreneurship, their competences in foreign languages and, of course, increasing their skills and capabilities for employability in an industrial sector which is the main key driver in many European regions. It is estimated that in the next five years there will be about 500 students benefiting directly from the educational materials developed within the project. These will become better equipped to contribute to the development of the sector, to fulfil the demand of highly qualified staff, to foster entrepreneurship in the sector, to support the professional development of existing specialists. The fact that the Programme is taught in English facilitates the mobility of staff from one EU country to another and through this the integration is facilitated.

## 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 climate change implications (short and long term). How do resources managers create solutions (case studies and practitioners). What are the different ways of doing applied research? Understanding Environmental Management 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 management that will allow him to make environment solutions for carbon neutral management. For that, this pillar is the base of the PARADOX 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 carbon neutral management processes. SMEs will not always have the full complement of environmental regulations and 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 environmentally sound solutions and are not limited by archaic 'outdated' knowledge.

These modules aim to prepare students for the complete process of carbon neutral management considering conceptual thinking.

The Masters also aims to provide the student with all the regulation and standards related with the carbon neutral management aspects. For that, is a supporting pillar of the manufacturing process pillar that will lead the enterprise to the success in terms of barriers of environmental targets.

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** 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 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

PARADOX 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 environment 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 PARADOX are mostly engineering technicians / technical engineers working in various thematic sectors or industries that are some kind involved in the resources management sector.

An engineering /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 assists 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 work in quality control, where they check environment products, do tests, and collect data. In environment 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.





ERASMUS + KA2



**INTELLECTUAL OUTPUT 2:**  
**Training path, learning content structure**  
**and guidelines for trainers.**  
**IO2/A2- Definition of learning content**  
**modules**

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# **1. DEFINITION OF LEARNING CONTENT MODULES**

This document presents a preliminary framework of Master's programme on water management for development and the implementation of innovative practice, a new training path for the water management as a result of climate change impact. The Master's programme was based on the concept of what a learner knows, understands, and can do on completion of a learning process defined in terms of knowledge, skills and competence.

Developing of materials related to key topics like: How to study and understand climate change implications (short and long term). How do resources managers create solutions (case studies and practitioners). What are the different ways of doing applied research? Understanding Environmental Management research methods; literature, practice-based outputs, designing research questions, studying art-based approaches to investigation, evaluation methods, dissemination, and impact.

## **2. STRUCTURE OF THE INTERNATIONAL MASTER'S DEGREE FOR WATER MANAGEMENT**

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:

6 Main modules (compulsory)

It was created a draft structure of the Master with the following steps: Main Modules

Main Modules will have 60 ECTS.

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

## **3. SELECTION OF THE FUNDAMENTAL MODULES**

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

It was 6 modules (or common to every student) which will be compulsory and each one with have the same number of credits:

The first three modules were the most selected ones to be included in the Master's Degree for the

water management sector at the survey and according the sector it has to be incorporated into the master (“Governance and Management of Water Resources” with 98% of votes, “Sustainable Water Management Legislation” with 97% and “Water Resources Systems Planning and Management” with 96%).

## **4. 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 six mandatory modules (60 ECTS): “Module 1 – GOVERNANCE AND MANAGEMENT OF WATER RESOURCES”, “Module 2 – SOCIAL, ECONOMIC AND ENVIRONMENTAL ASPECTS”, “Module 3 – SUSTAINABLE WATER MANGEMENT LEGISLATION”, “Module 4 – SUSTAINABLE WATER MANAGEMENT INDICATORS”, “Module 5 – WATER RESOURCES SYSTEMS PLANNING AND MANAGEMENT”, “Module 6 – ENGINEERING HYDROLOGY”.

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’s program.

## **5. 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 to the necessities: videos, slides, bibliographic material, hands-on training session.

The content of the modules, subjects and units will be done in English; however, the consortium will analyse the possibility of releasing some of the content in Spanish, Romanian, Portuguese and Italian 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 Portuguese, Italian and Spanish too.

## 6. MODULES IN THE MASTER'S PROGRAMME

Modules are made to regularize the contents of the Master and make its structure easier to be understood. The 6-compulsory subjects of the beginning will be a fundamental module by itself:

**MODULE 1 (FM): GOVERNANCE AND MANAGEMENT OF WATER RESOURCES – 10 ECTS**

**MODULE 2 (FM): SOCIAL, ECONOMIC AND ENVIRONMENTAL ASPECTS – 10 ECTS**

**MODULE 3 (FM): SUSTAINABLE WATER MANAGEMENT LEGISLATION – 10 ECTS**

**MODULE 4 (FM): SUSTAINABLE WATER MANAGEMENT INDICATORS –10 ECTS**

**MODULE 5 (FM): WATER RESOURCES SYSTEMS PLANNING AND MANAGEMENT - 10 ECTS**

**MODULE 6 (FM): ENGINEERING HYDROLOGY - 10 ECTS**

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Master	ECTS
FUNDAMENTAL MODULES	60



## 6.1 BREAKING DOWN MODULES, SUBJECTS AND LEARNING UNITS

### MODULE 1 (FM): GOVERNANCE AND MANAGEMENT OF WATER RESOURCES – 10 ECTS

LEADER TO DEVELOP CONTENTS: BUCKINGHAMSHIRE NEW UNIVERSITY

UNITS

**UNIT 1:**

**UNIT 2:**

**UNIT 3**

**UNIT 4:**

**UNIT 5:**

**UNIT 6:**

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

## **6.2 GUIDELINES FOR TRAINERS**

A commitment was made within the PARADOX project to develop Guidelines for the Trainers involved in delivering the content for the training material for the “Master’s programme”. 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.

## **6.3 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.

### **6.3.1 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 students handbook as well as in any other educational environment at all levels.
- Teaching relationships refer to the relationship’s 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.

### **6.3.2 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 meant 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.

### **6.3.3 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.

#### **6.3.4 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.'

### 6.3.5 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.'

### 6.3.6 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.

### **6.3.7 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.’

### 6.3.8 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 environment object is located. The teacher in a history of design session helps learners to construct knowledge about the history of environment 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 environment 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 environment 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 environment 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 environment 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 environment brochures and magazines. The task is to find pictures in the brochures of as many famous environment 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 environment piece to add to their displays. They also have a environment design guide that they can use.

### **6.3.9 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.

### **6.3.10 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 Slavin (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 an environment-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.

### 6.3.11 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 Shafel (1970): (a) warming up the group, (b) selecting participants, (c) setting the stage, (d) preparing observers, (e) enacting the role play, 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 environment 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.
- 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.

## 6.4 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.

#### **6.4.1 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

#### **6.4.2 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.

#### **6.4.3 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.

#### **6.4.4 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 independently of the operative system, device and thenavigator.
- 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 PARADOX 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 materials about design of products different from the environment.

- 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.

#### **6.4.5 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 other 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*

#### **6.4.6 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 an environment 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.

#### **6.4.7 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.

#### **6.4.8 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.*

#### **6.4.9 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?"

#### **6.4.10 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.

- -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.

#### **6.4.11 ANALYSIS OF TRAINERS’ NEEDS**

Students Handbook 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.

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 students handbook, 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).

#### **6.4.12 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

Assess  
ment  
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.

#### **6.4.13 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.

#### **6.4.14 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.

## **7. METHODS AND TOOLS FOR THE DELIVERY OF THE CONTENT THROUGH THE PARADOX 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
3. teaching and learning that meets the required learning objectives and learning outcomes.
4. There are many examples of effective practice in vocational teaching and learning.
5. Teachers believe that in many cases, practice is directly transferable from one vocational area to another.
6. Teachers indicate that they also vary their practice, for example, in response to the different levels of the programmes and abilities of learners.
7. Vocational teaching and learning is underpinned by some learning theories – experiential

learning and learning styles theories being the most prevalent.

8. Teachers draw extensively on their own experiences and those shared with colleagues.
9. Teaching relationships were identified as crucially important.
10. Teaching models did not appear to be used intentionally in a planned and systematic way by teachers when deciding how to teach.
11. 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.
12. 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.
13. 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. Interestgroups. Provide opportunities for small-group discussion and exchange.
9. 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).

10. 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.
11. 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.

## **8. ENSURE OPEN LICENSES OER FOR TRAINING MATERIALS**

The results of the PARADOX 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. EVM 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)<sup>1</sup>. 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



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 Commons Attribution-Non Commercial- Share Alike

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The consortium has used their know-how and expertise in the field of environment 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 Bibliography<sup>2</sup> to reference those sources.

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### Teaching

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ERASMUS + KA2



**INTELLECTUAL OUTPUT 2:**  
**Training path, learning content structure and**  
**guidelines for trainers.**  
**IO2/A3- Harmonisation and validation of**  
**learning modules and**  
**training paths**

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<b>Author:</b>	BNU, Florin Ioras
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## **HARMONISATION AND VALIDATION OF LEARNING MODULES AND TRAINING PATHS**

The aim of this report is to reflect the work carried out during the Activity 3 of Intellectual Output 2: “Harmonisation and validation of learning modules and training paths”. It has been done in a very close collaboration with BNU and UTB, lead responsables of Activities 1 and 2 of the same Intellectual Output, “Training paths definition” and “Definition of the content modules”, respectively. Thereby, both the Training Paths and the Modules have been defined attending the harmonization.

This way, once Activities 1 and 2 have been completed, the International Master Modules for water management has a very well-defined Training Paths and Learning Modules. Considering the competences needed in the industry that the Intellectual Output 1 indicate, these Training Paths will provide the future students the skills that the industry demands.

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 (10 ECTS): “Module 1 – GOVERNANCE AND MANAGEMENT OF WATER RESOURCES”, “Module 2 – SOCIAL, ECONOMIC AND ENVIRONMENTAL ASPECTS”, “Module 3 – SUSTAINABLE WATER MANGEMENT LEGISLATION”, “Module 4 – SUSTAINABLE WATER MANAGEMENT INDICATORS”, “Module 5 – WATER RESOURCES SYSTEMS PLANNING AND MANAGEMENT”, “Module 6 – ENGINEERING HYDROLOGY”.

they will acquire their specialization:

- For Production, students must perform modules 1, 2, 3, 4, 5 and 6.
- For Design, students must perform modules 1, 2, 3, 4, 5 and 6.
- For Business, students must perform modules 1, 2, 3, 4, 5 and 6.
- For Research, students must perform modules 1, 2, 3, 4, 5 and 6.

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. Thus, it is considered that the learning modules and training paths are harmonized and validated.

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“PATADOX” has been funded with support from the European Commission. This work reflects the opinion of the author and the Commission cannot be held responsible for any use of the information contained therein

ERASMUS + KA2



**INTELLECTUAL OUTPUT 2:**  
**Training path, learning content structure and**  
**guidelines for trainers.**  
**IO2/A4- Development of the guidelines for**  
**trainers**

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## 1. INTRODUCTION

The roles of the teachers and trainers are becoming more intensified as changes in laws, systems, organizations, qualifications, technology, work practices and social attitudes accelerate.

New goals and core skills for students and trainees such as self-direction, problem solving, team working, enterprise, self-confidence, make increasing demands on their teachers and trainers.

Teachers need to be facilitators of learning in addition to being instructors; trainers need the refined skills of the coach and mentor in addition to being supervisors of their trainees. They need an increased repertoire of teaching styles, both traditional and constructivist and continuing professional development to adapt their repertoire to changing education goals.

In the recent years, the role of teachers and trainers in ensuring effective education and training systems has been at the core of the European agenda.

In its communication “Rethinking Education” (2012), the European Commission notes that the revision and strengthening of the professional profile of all teaching professions is an essential step to reform education and training system.

In this sense, the Commission stresses the need of introducing “coherent and adequately resourced systems for recruitment, selection, induction and professional development of teaching staff based on clearly defined competences needed at each stage of a teaching career and increasing teacher digital competence.

The same focus on the importance of teacher education is put by the EU Council, which emphasizes the need to implement appropriate policies for attracting and recruiting teachers, for providing them with effective initial training education and for ensuring that they can receive constant update of their competences.

## 2. DEFINING TEACHERS AND TRAINERS

Teachers and trainers have different roles and responsibilities in the learning process. It is possible to distinguish between them according to their function and place of employment, despite the differences that exist between countries in how their roles and responsibilities are defined.

Teachers are typically based in schools or related institutions, where they teach either general subjects



or vocational theoretical subjects.

In some cases, teachers of practical subjects work in school workshops or simulated learning environments. Trainers, by contrast, are based in and employed by companies. They are often regular employees with occupational responsibilities, as well as responsibilities to train and accompany learners during the company-based part of their learning.

Teachers	Trainers
Of practical subjects, in some cases, work in school workshops or simulated learning environments of practical subjects. Teach either general subjects or vocational theoretical subjects. Roles are increasingly moving towards guiding and enabling learning in cooperation with different teachers and working life representatives.	are based in and employed by companies. are usually a worker with relevant work experience in the company and pedagogical skills. Have responsibility for training and accompanying learners when in companies

Table 1- Comparison Between Teachers and Trainers

## 2.1 TEACHERS' COMPETENCES

Before addressing the meaning of teacher competence, we must first establish the meaning of competence. Competency is a term used extensively by different people in different contexts; hence, it is defined in different ways. Teacher education and job performance are two contexts in which this term is used. Competencies are the requirements of a “competency-based” teacher education and include the knowledge, skills and values a teacher-trainee must demonstrate for successful completion of a teacher education programme.

Some characteristics of a competency are as follows:

- A competency consists of one or more skills whose mastery would enable the attainment of the competency.
- A competency is linked to all three of the domains under which performance can be assessed: knowledge, skills, and attitude.
- Possessing a performance dimension, competencies are observable and demonstrable.
- Since competencies are observable, they are also measurable. It is possible to assess a



competency from a teacher's performance. Teaching competencies may require equal amounts of knowledge, skill, and attitude, but some will not. Some competencies may involve more knowledge than skill or attitude, whereas some competencies may be more skill or performance based.

Teachers are generally required to possess at least technical upper secondary education in combination with professional experience in their area of expertise. Some type of pedagogical training is generally mandatory, though industry professionals are generally permitted to start teaching while initiating their pedagogical training.

Teachers need a wide range of competencies to face the complex challenges of today's world. Teaching competency is an inherent element of an effective training process, one that aspires to contribute to the welfare of a particular country or the world, itself.

The central figures in the educational process are teachers. The success of training and education depends on their preparation, erudition, and performance quality.

During their professional careers, teachers pass through the following levels of professional growth to achieve the acme of professional competency.

- 1st level: pedagogical ability – characterized by detailed knowledge of the subject.
- 2nd level: pedagogical skill – perfected teaching skill.
- 3rd level: pedagogical creativity – marked by implementation of new methods and techniques into educational activities.
- 4th level: pedagogical innovation – distinguished by the incorporation of essentially new, progressive theoretical ideas, principles and methods of training and education.



## TEACHER COMPETENCES

<i>Pedagogical competences</i>	Provides the students / participants a safe learning and working environment that supports to make choices that assist in his or her development
<i>Didactical &amp; methodological competences</i>	Knows various educational strategies, methods, and techniques for teaching, educating, learning and motivating students; Utilise technology, including multimedia resources, effectively and appropriately to aid learning;
<i>Subject knowledge</i>	Thorough knowledge of the subject; Creates a powerful learning environment, including by bringing the learning aspect in connection with the knowledge of the profession in society.
<i>Communication &amp; relational skills</i>	Set clear, challenging and achievable expectations for learners, be able to plan and communicate accordingly and motivate and assist learners to become agents in their learning.
<i>Professional (self-)development</i>	Reflects on their practices, relying on experience, research and other relevant resources to the assessment of their professional development, particularly in their own training project.
<i>Reflective practice &amp; assessment</i>	
<i>Organisational &amp; group management skills</i>	Uses a range of strategies to support, monitor and assess learning, students' approach to learning, progress achieved, and give feedback.
<i>Research competences</i>	Contributing to school management and development.
	Research competence.

Table 2 – Teachers' Competence Resume



### 2.1.1 21ST-CENTURY TEACHING COMPETENCIES

21st-century competencies have been defined as the knowledge, skills, and attitudes necessary to be competitive in the 21st century workforce. Teacher preparation and professional development should be reworked to incorporate training in teaching key competencies.

The 21st-century teacher needs to know how to provide technologically supported learning opportunities for students and know how technology can support student learning.

1. Teachers demonstrate leadership
  - a. Teachers lead in the classroom by:
    - evaluating student progress using a variety of assessment-data measuring goals;
    - drawing on appropriate data to develop classroom and instructional plans;
    - maintaining a safe and orderly classroom that facilitates student learning; and
    - positive management of student behavior, effective communication to defuse and deescalate disruptive or dangerous behavior, and safe and appropriate seclusion and restraint techniques.
  - b. Teachers demonstrate leadership in the school by:
    - engaging in collaborative and collegial professional learning activities;
    - identifying the characteristics or critical elements of a school improvement plan; and
    - displaying an ability to use appropriate data to identify areas of need that should be addressed in a school improvement plan.
  - c. Teachers lead the teaching profession by:
    - participating in professional development and growth activities; and
    - developing professional relationships and networks.
  - d. Teachers advocate for schools and students by:
    - implementing and adhering to policies and practices positively affecting students' learning.
  - e. Teachers demonstrate high ethical standards.
2. Teachers establish a respectful environment for a diverse population of students
  - a. Teachers provide an environment in which each child has a positive, nurturing relationship with caring adults by:



- maintaining a positive and nurturing learning environment.
  - b. Teachers embrace diversity in the school community and in the world by:
    - using materials or lessons that counteract stereotypes and acknowledge the contributions of all cultures;
    - incorporating different points of view in instruction; and
    - understanding the influence of diversity and planning instruction accordingly.
  - c. Teachers treat students as individuals by:
    - maintaining a learning environment that conveys high expectations of every student.
  - d. Teachers adapt their teaching for the benefit of students with special needs by:
    - cooperating with specialists and using resources to support the special learning needs of all students; and
    - using research-verified strategies to provide effective learning activities for students with special needs.
  - e. Teachers work collaboratively with families of students and other significant adults by:
    - communicating and collaborating with the home and community for the benefit of students.
3. Teachers know the content they teach
- a. Teachers develop and apply lessons based on an effective course of study by:
    - integrating effective literacy instruction throughout the curriculum and across content areas to enhance student learning.
  - b. Teachers honor the content appropriate to their teaching specialty by:
    - demonstrating an appropriate level of content knowledge in their specialty; and
    - encouraging students to investigate the content area to expand their knowledge and satisfy their natural curiosity.
  - c. Teachers show they recognize the interconnectedness of content areas/discipline by:
    - demonstrating a knowledge of their subject by relating it to other disciplines; and
    - relating global awareness of the subject.
  - d. Teachers make their instructions relevant to students by:
    - integrating 21st-century skills and content in instruction.



4. Teachers facilitate learning for their students
  - a. Teachers show they know the ways in which learning takes place and the appropriate levels of intellectual, physical, social, and emotional development of their students by:
    - identifying developmental levels of individual students and planning instruction accordingly; and
    - assessing and using those resources needed to address the strengths and weaknesses of students.
  - b. Teachers plan instruction appropriate to their students by:
    - collaborating with colleagues to monitor student performance and making instruction responsive to cultural differences and individual learning needs.
  - c. Teachers show their acumen and versatility by:
    - using a variety of methods and materials suited to the needs of all students.
  - d. Teachers display their awareness of technology's potential to enhance learning by:
    - integrating technology into their instruction to maximize student learning.
  - e. Teachers help students grow as thinking individuals by:
    - integrating specific instruction that helps students develop the ability to apply processes and strategies for critical thinking and problem solving.
  - f. Teachers help students to work in teams and develop leadership qualities by:
    - organizing learning teams for the purpose of developing cooperation and student leadership.
  - g. Teachers reach their students best by:
    - using a variety of methods to communicate effectively with all pupils; and
    - consistently encouraging and supporting students to articulate thoughts and ideas clearly and effectively.
  - h. Teachers best assess what students have learned by:
    - using multiple indicators, both formative and summative, to monitor and evaluate student progress and to inform instruction; and
    - providing evidence that students are attaining 21st-century knowledge, skills and dispositions.
5. Teachers reflect on their practice
  - a. Teachers analyze student learning by:





- using data to provide ideas about what can be done to improve student learning.
- b. Teachers link professional growth to their professional goals by:
  - participating in recommended activities for professional learning and development.
- c. Teachers function effectively in a complex, dynamic environment by:
  - using a variety of research-verified approaches to improve teaching and learning

Ideally, then, teachers should demonstrate the following competencies:

- 1) effective classroom management, maximizing efficiency, maintaining discipline and morale, promoting teamwork, planning, communicating, focusing on results, evaluating progress, and making constant adjustments. A range of strategies should be employed to promote positive relationships, cooperation, and purposeful learning. Organizing, assigning, and managing time, space and activities should ensure the active and equitable engagement of students in productive tasks.
- 2) effective teaching practices, representing differing viewpoints, theories, “ways of knowing” and methods of inquiry in the teaching of subject matter concepts. Multiple teaching and learning strategies should help engage students in active learning opportunities that promote the development of critical thinking, problem solving, and performance capabilities while helping them assume responsibility for identifying and using learning resources.
- 3) effective assessment, incorporating formal tests; responses to quizzes; evaluation of classroom assignments, student performances and projects, and standardized achievement tests to understand what students have learned. Assessment strategies should be developed that involve learners in self- assessment activities to help them become aware of their strengths and needs and encourage them to set personal goals for learning.
- 4) technology skills, knowing when and how to use current educational technology, as well as the most appropriate type and level of technology to maximize student learning.



## 2.2 TRAINERS' COMPETENCES

European Member State tend to set minimum requirements for teaching professionals that start working for VET institutions. This is different for trainers in companies, who are often recruited for a trainer position from within the company. They are nominated by their employer to take up the position of work-based learning trainer in the company, while continuing their own function as well.

Typical common tasks of trainers are:

- selecting appropriate training methods for developing practical skills in a real work situation;
- planning and implementing training, assessing, and providing feedback for trainees.

Generally, trainers are also expected to ensure a link between the worlds of work and education, though often this link is the responsibility of a school and its teachers.

Nowadays, trainers often need to go beyond conveying vocational knowledge and skills and supporting workers in practical learning. This requires enriching the role of an 'instructor' with coaching and mentoring, providing guidance and stimulating learning culture in enterprises.

Table 3 – Trainers' Competence Resume

### TRAINER COMPETENCES

<i>Pedagogical, andragogical, psychological competences</i>	To support apprentices with learning difficulties through individual design of the training and learning guidance, reach supportive aids if necessary and consider providing the possibility to extend the training time.
<i>Social, communicative, and motivational skills</i>	The trainer must be able to create conditions conducive to learning and create a motivating learning culture which includes give and receive feedback.
<i>Practical training content</i>	The trainers must be able to create based on training regulations a company training plan, which is geared particularly toward professional and business processes typical for the work.
<i>Guidance monitoring, evaluation, and assessment</i>	Assessment of a candidate's competences through tests for competence-based qualifications



*Didactical & methodological*

Views information about the training institute, the needs of the participant and the opportunities within the training

*Legal framework and responsibilities*

*Personal development & cooperation*

company to examine how the learning objectives can be achieved.

Planning of vocational skills demonstrations and/or competence tests.

Understand their own functions and the contractual elements of the sector and/or company in terms of training

The workplace instructor develops his or her own work as an instructor.

Manage relationship with people outside the



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