



## Learning outcomes in ESCO

### QUATREC 2 international conference

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Services, ELA

# EU policies promoting learning outcomes

- **European Qualifications Framework (EQF):** driver of the learning outcomes approach – enhances transparency and comparability of qualifications – opens the path to validation
- Learning outcomes are increasingly used, but challenges still persist (e.g. teaching, assessment).
- Currently, work is on-going work on developing **Guidelines** for **short description of learning outcomes** for their publication in databases/registers.
- ESCO: a tool to enhance common understanding of concepts when drafting learning outcomes.

# Why is ESCO relevant for qualifications?

ESCO is a common reference language that supports:

- transparency
- comparison,
- identification and
- analysis of the content of a qualification.

**Describe & understand  
Learning outcomes of  
qualifications**

Skills & knowledge as  
common factor

**Enhance personalised  
career guidance services**

Recommend personalised  
career paths & learning

**Support validation of  
informal/non-formal  
learning**

Digital badges/micro-  
credentials



# How to use ESCO for qualifications/training?

- Use the occupational profiles as a starting point
- Get inspiration from the skills and competencies described in ESCO
- Make use of the IT tool (soon to be provided publicly) on referencing learning outcomes of qualifications to ESCO skills
- Use ESCO skills for developing skills intelligence (skills in high demand) & use the results to inform curricula reform

0 - Armed forces occupations	+
1 - Managers	+
2 - Professionals	+
3 - Technicians and associate professionals	-
31 - Science and engineering associate professionals	-
311 - Physical and engineering science technicians	+
312 - Mining, manufacturing and construction supervisors	-
3121 - Mining supervisors	+
3122 - Manufacturing supervisors	-
3122.1 - dairy processing technician	
3122.2 - food production planner	
<b>3122.3 - industrial assembly supervisor</b>	<b>+</b>
3122.4 - production supervisor	+
3122.5 - waste management supervisor	
3123 - Construction supervisors	+

# industrial assembly supervisor

Discuss in the forum

Download

Technicians and associate professionals >  
 Science and engineering associate professionals > Mining, manufacturing and construction supervisors >  
 Manufacturing supervisors > industrial assembly supervisor >

## Description

### Code

3122.3

### Description

Industrial assembly supervisors are in charge of organizing, planning and coordinating assembly operations. They keep track of all the work activities and manage the process for efficient functioning in order to tackle problems such as production loss. They answer to the industrial production and the manufacturing manager.

### Alternative Labels

- production assembly supervisor
- assembly forewoman
- assembly foreman
- assembly controller
- assembly line supervisor
- goods compliance supervisor
- assembly chargehand
- assembly co-ordinator
- quality control supervisor
- assembly planner
- assembly overseer
- goods production supervisor
- assembly team leader
- quality supervisor
- industrial assembly supervisor

## Skills & Competences

### Essential Skills and Competences

- manage budgets
- oversee assembly operations
- manage health and safety standards
- adjust production schedule
- create manufacturing guidelines
- provide department schedule for staff
- meet deadlines
- develop manufacturing policies
- create solutions to problems
- report on production results
- wear appropriate protective gear
- liaise with managers
- train employees
- plan shifts of employees
- follow production schedule
- manage resources
- read standard blueprints
- oversee quality control
- optimise production
- supervise work
- manage staff
- control production
- cope with manufacturing deadlines pressure
- analyse production processes for improvement
- define manufacturing quality criteria
- oversee production requirements
- keep records of work progress
- communicate production plan
- meet productivity targets

### Essential Knowledge

- manufacturing processes
- industrial software
- industrial engineering
- quality standards
- industrial design
- production processes

### Optional Skills and Competences

- perform data analysis
- follow manufacturing work schedule
- manage manufacturing documentation
- disaggregate the production plan
- arrange equipment repairs
- adapt production levels
- advise on machinery malfunctions
- evaluate employees work
- apply control process statistical methods
- monitor manufacturing quality standards
- ensure finished product meet requirements
- communicate problems to senior colleagues
- analyse the need for technical resources
- recruit personnel
- plan manufacturing processes
- check material resources
- liaise with quality assurance
- motivate employees
- use CAM software



# Why linking qualifications to skills

Enrich information on qualifications: linking their learning outcomes to skills allows to directly identify relevant qualifications for missing skills.

Promote transparency of information on qualifications: employers grasp qualifications' labour market value in a cross-border context, thus supporting labour mobility.

Individuals improve chances on labour market through better skills-based job matching.

Support upskilling-reskilling by matching individuals with the right training.

# ESCO Linking Pilot: Background

2018 study recommended testing an automated approach based on Natural Language Processing with an initial degree of human intervention.

COM presented the study outcomes during the 2019 EQF AG/MSWG joint meeting and proposed to pilot the proposed approach.

A pilot project with 5 Member States (LV, NL, PL, RO and SI) was conducted in 2019. COM developed a first proof of concept for an IT tool supporting the linking of LOs to skills.

A second pilot was organised in 2020. COM provided an improved version of the IT tool.

# Objectives of the pilot

Testing the linking in different EU languages and for qualifications of different type and levels.

Gather verified data on the links between learning outcomes of qualifications and ESCO skills in order to further improve the underlying algorithms.

Test the improvements of ESCO v.1.1 and the application of the revised transversal skills structure in this domain.

Test how ESCO skill groups can be used to introduce a certain level of abstraction for qualifications from higher EQF levels.

Getting feedback on the ESCO skills pillar.



# Technical Solution

## Machine Learning Algorithm

### Expected Output:

Suggestions of ESCO skills based on the input text

### Challenges:

- Input texts in several languages
- Input text variations: broad vs. detailed descriptions
- Relevant segmentation of the text
- Word ambiguity
- Concepts “compatibility”

# ESCO linking pilot

The screenshot displays the 'Learning Outcome - Linking' interface. The top navigation bar includes the European Commission logo, the title 'Learning Outcome - Linking', and progress indicators for 'ECCOEN EN Qualifications' (0/15) and 'ESCO skills' (0/189). The left sidebar shows a list of learning outcomes, with 'Sustainable Urban Water Systems' selected. The main content area shows the details for this learning outcome, including its concept identifier (b687368a-bd9d-41f7-b961-5ecd927a836), a general description, and a highlighted focus on stormwater management and water supply strategies. Below the description, there are tabs for 'Browse', 'API search', 'ML suggestions', and 'Occupation browsing'. The 'ML suggestions' tab is active, showing a list of related skills such as 'manage water flows and catchments', 'water policies', 'conserve water resource', 'develop flood remediation strategies', and 'water consumption'.

European Commission | Learning Outcome - Linking

Progress: 0 / 15  
ECCOEN EN Qualifications

Progress: 0 / 189  
ESCO skills

en ECCOEN EN Qualifications → en ESCO skills

Version: 1.1.0

Filter...

- Active Learning for Soft Skills Development
- Artificial Intelligence and legal issues
- Artificial Intelligence: An Overview
- Designing Learning Innovation
- Discovering Nuclear- and Radio-Chemistry
- Ethics of Artificial Intelligence
- Fostering women's participation to STEM through MOOCs
- Integrity and beyond MOOC
- New paradigms in wastewater management: from a sanitation problem to a circular sustainable solu...
- Platform Thinking: designing a Platform
- Platform Thinking: exploiting data through platforms
- Platform Thinking: what's beyond Uber?
- Sustainable Urban Water Systems**
- Technologies and platforms for Artificial Intelligence
- Water: an essential resource

## Sustainable Urban Water Systems

In progress

Concept identifier  
b687368a-bd9d-41f7-b961-5ecd927a836

Description  
General description:  
- The MOOC "Sustainable Urban Water Systems" aims to provide knowledge about modern and sustainable solutions for urban water systems in water sensitive cities. Focus is on stormwater management and water supply strategies for the mitigation of effects on the water cycles due to human settlements. Sustainable strategies integrate Nature-based Solutions (NbS) and Green Infrastructures (GI) to make cities resilient in front of global challenges, adding benefits to both the environment and community.  
The first link shows an example of water cycle resilience in urban areas that is based on solutions in nature-based water systems (NbS).

Learning Outcome Entities (1)

General description:  
- The MOOC "Sustainable Urban Water Systems" aims to provide knowledge about modern and sustainable solutions for urban water systems in water sensitive cities.

Focus is on stormwater management and water supply strategies for the mitigation of effects on the water cycles due to human settlements.

Sustainable strategies  
Integrate Nature-based Solutions (NbS) and Green Infrastructures (GI) to make cities resilient in front of global challenges, adding benefits to both the environment and community.

Browse API search ML suggestions Occupation browsing

Filter...

Hidden results are not shown

- + manage water flows and catchments
- + water policies
- + conserve water resource
- + develop flood remediation strategies
- + water consumption

# Features of the third phase

18 participants:

- 7 EU MS
- 1 EU Agency
- 5 training providers
- 4 private companies
- 1 third country organisation

Qualifications to be tested:

- Both higher education and VET
- Formal and non-formal.
- Private and Apprenticeships qualifications
- Covering EQF levels 3-8
- Min 30, max 250

# Improvements on algorithm to suggest skills

Skill suggestions based on three algorithms in the new version of the tool:

- Word2vec model: English
- Semantic Embedding Mapping model: English
- Sentence BERT: Multilingual

Available validation data allow to compare performance and iteratively improve:

	All_esco_api	All_w2v	All_sem11	All_sem13	All_sem17	All_sem18	SBert1	SBert6	SBert7	SBert8	Combined
Unique Total Records	3232	3259	3213	3213	3213	3213	3240	3244	3244	3244	3283
Unique Top1	0.170482673	0.304081	0.16651105	0.2159975	0.2296919	0.2284469	0.2148148	0.2096178	0.212392	0.204377	0.2564727
Unique Top3	0.301670792	0.484198	0.28913788	0.3709928	0.3856209	0.3918456	0.3632716	0.3757707	0.372996	0.348952	0.4794395
Unique Top5	0.366955446	0.564284	0.35792095	0.4431995	0.4662309	0.4721444	0.4469136	0.4627004	0.45561	0.433724	0.5653366
Unique Top10	0.452970297	0.659712	0.44475568	0.5496421	0.5739185	0.5689387	0.5469136	0.573058	0.565351	0.544698	0.679866
Unique Top20	0.529393564	0.734581	0.53283536	0.6277622	0.660442	0.6495487	0.645679	0.6747842	0.660604	0.646424	0.7675906


# Lessons learned

- Linking learning outcomes to skills is done best in the native language.
- Human intervention is an important component for ensuring quality of linking.
- Further improvements of the AI algorithm will reduce the time and resources needed to perform the work.
- Level of granularity and sectoral coverage of ESCO skills can lead to different results according to type of qualifications tested.
- The structure of learning outcomes is a key factor for the functioning of the AI algorithm.

# Lessons learned


- The ESCO skills hierarchy supports the search of relevant skills within the ESCO dataset.
- Linking to higher levels of the hierarchy and an improved transversal skills structure could further support qualitative linking, in particular for HE qualifications.
- On average, 1 to 3 ESCO skills or knowledge concepts are mapped to each learning outcome.
- The performance of the AI algorithm showed promising results, however more data are needed to further improve quality of suggestions.

# ESCO in practice: European Digital Credentials for



## Graduate University Study of Civil Engineering

Valid from: 20/09/2019 00:00 GMT +0200 | Type: Mandated Issue



Credential Preview | Export | Upload another credential | Share | English

Ana Andromeda

University Great

Master of Science in Civil Engineering

Applied mathematics course

Applied mathematics Study visit

Concrete structures I course

Dynamics of structures and earthquake engineering course

Geotechnical engineering course

Stability of structures course

Postgraduate doctoral study

Civil engineer

Recognition for credit

Proven by

Title	Grade
Overall Assessment	excellent (5)

Influenced by: Applied mathematics course, Applied mathematics Study visit, Concrete structures I course, Dynamics of structures and earthquake engineering course, Geotechnical engineering course, Stability of structures course

Entitles Owner to: Postgraduate doctoral study , Civil engineer , Recognition for credit

Sub-Achievements

Applied mathematics, Concrete structures I, Dynamics of structures and earthquake engineering, Geotechnical engineering, Stability of structures

Specification

Ach-Spec-ID-Scheme identifier: AchSpecID-72

**Learning Outcomes:**

LO1 related to applied mathematics

LOID-Scheme identifier: LOID-73a

To formulate equations of mathematical physics for engineering problems, and to solve them analytically or with numerical methods.

Type: knowledge

Reusability Level: cross-sector skills and competences

**Related ESCO Skills:** use mathematical tools and equipment, execute analytical mathematical calculations, geodesy

**Related Skills:** applied mathematics, perform engineering calculations, construct earthquake resistant structures

## ESCO:

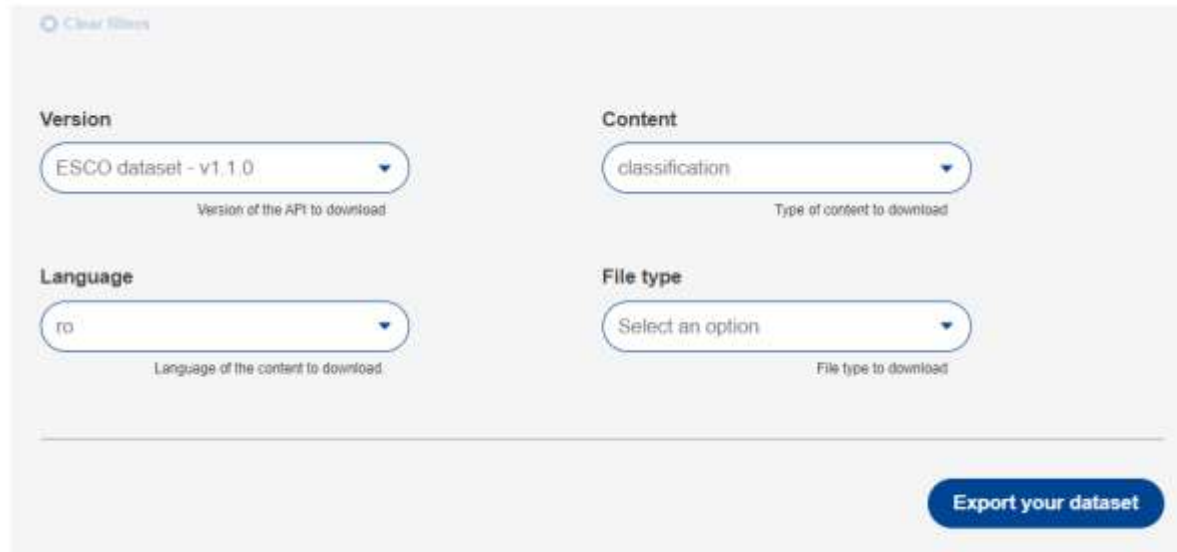
- *describing, identifying and classifying professional occupations and skills relevant for the EU labour market and education and training area*
- *systematically showing the relations between those occupations and skills*

*ELM allowing cross-references*

# How to get started with ESCO?

## DOWNLOAD From the ESCO Portal

<https://esco.ec.europa.eu/en/use-esco/download>



The screenshot shows a web interface for downloading ESCO data. At the top left, there is a 'Clear filters' link. Below it, there are four filter sections, each with a dropdown menu and a label below it:

- Version:** The dropdown menu is set to 'ESCO dataset - v1.1.0'. Below it is the text 'Version of the API to download'.
- Content:** The dropdown menu is set to 'classification'. Below it is the text 'Type of content to download'.
- Language:** The dropdown menu is set to 'ro'. Below it is the text 'Language of the content to download'.
- File type:** The dropdown menu is set to 'Select an option'. Below it is the text 'File type to download'.

At the bottom right of the interface, there is a blue button labeled 'Export your dataset'.

## UPON REQUEST ESCO Secretariat

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*Technical support* on how to use ESCO



THANK YOU

