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Brussels**

Note ESCO MSWG 11 - 3

**Initial results from the pilot linking Learning Outcomes of qualifications with
ESCO skills**

The present document aims at reporting to members of the EQF AG and the ESCO MSWG on the initial results of the pilot project for testing the use of an automated approach for linking learning outcomes of qualifications to ESCO skills. The document also proposes a way forward for a potential second phase of the project.

Background

The pilot project was designed further to the discussion in the joint EQF AG – ESCO MSWG meeting of 6 February 2019 on the results of the Qualifications Pillar study¹ that was carried out in 2018 and which tested (semi-)automated linking for 8 qualifications.

The study concluded that automated linking is possible, but that human intervention is needed to correct for errors. Following up on the conclusions of the study, the Commission decided to test the use of an automated approach based on methods for natural language processing with an initial degree of human intervention and issued a call for expression of interest addressed to members of the EQF AG and of the ESCO MSWG. The pilot had the following objectives:

- Testing the suitability of the linking approach for different actors/institutions, different types of qualifications and different publication processes across Member States. For this, it is important to understand internal processes at national level and to identify the actors involved.
- Testing the linking in different EU languages of qualifications with different EQF levels and in different subject areas.

¹ The study is published online and can be found here:

<https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8181&furtherPubs=yes>

- Defining potential requirements and building a user-friendly IT tool to support the linking process.
- Assessing the required effort by awarding bodies/competent authorities to create these links.
- Getting feedback on the ESCO skills pillar that will feed into the ESCO continuous improvement process.

Four Member States (the Netherlands, Greece, Poland and Slovenia) participated in piloting this approach, while Latvia and Romania joined the pilot as observers.

Project implementation

The project started in March 2019 and ended in December 2019 and was divided in two phases.

The first phase aimed at collecting information on internal processes at national level and on the organisations participating in the pilot and at receiving suggestions from participating countries on the requirements for an IT tool to be used to link learning outcomes of qualifications with ESCO skills.

To this end, the Commission asked participating and observing Member States to fill in a questionnaire providing information on the internal governance of national qualifications systems, the process for publishing qualifications in national databases and for describing learning outcomes, the organizations participating in the pilot and the qualifications that will be tested.

A first project workshop was organised on 19 June 2019 to discuss the results of the questionnaires and present the proof of concept of the IT tool. During the workshop, participating countries described the national landscape and the qualifications that will be used in the project and the Commission presented a proof of concept of the IT tool. The workflow offered by the tool provided for the decomposing of free-text based learning outcomes in single items, the suggestions of relevant ESCO skills based on machine learning, the selection of relevant skills by the reviewer and an export functionality.

Further to the first workshop, the IT tool and its user manual were presented to the participants in a webinar on 14 October 2019. The webinar was open also to members of the ESCO Maintenance Committee.

During the second phase of the project, started in October 2019, participating countries used the IT tool to link learning outcomes of qualifications to ESCO skills and presented the results of the linking exercise during a final workshop on 10 December 2019². The workshop's agenda included individual national presentations of the project results, a discussion on common issues identified by participating countries, feedback on the functioning of the IT tool and on the further improvements to be prioritized for future development, a discussion on the ESCO skills pillar and an exchange of views with participating countries on the next phase of the project. To this end, prior to the meeting the Commission circulated a list of questions and points of interest on the perceived quality of the ESCO vocabulary and on the usage of the IT tool.

² Greece and Latvia could not participate in the final workshop

Features of the IT tool supporting automated linking of learning outcomes of qualifications to ESCO skills

The platform has three main functionalities:

- Split learning outcomes description texts into separate conceptual entities;
- Provide suggestions of matching ESCO skills through a Machine Learning algorithm;
- Export a list of ESCO skills concepts that relate to the learning outcome of the qualification.

Feedback of the group and preliminary results of the pilot project

Participating countries agreed on the importance of linking learning outcomes of qualifications to skills, with some countries currently implementing similar initiatives at national level. Participants shared the policy goals of bridging the world of education and training and the labour market and promoting transparency of qualifications across the EU.

The project also demonstrated the advantages offered by Artificial Intelligence (AI) and machine learning components for the continuous improvement of ESCO, where technologies based on Natural Language Processing can support the feedback process for the next version of ESCO and at the same time enable different applications of the ESCO taxonomy.

The main results of the pilot project can be summarized as follows:

- The human component is fundamental in order to understand the context of data and review and validate the results provided by AI and machine learning technology. The automation of the linking process provides for a significant reduction of the resources needed to perform the exercise and makes the process more sustainable for public authorities.
- The decision on the users of the tool should be left at national level, with a system of delegation between national authorities as the preferred approach.
- Under the current version of the tool, input text in national languages is translated into English for a smoother functioning of the matching algorithm, with matching results provided in the national language. Different formats for drafting learning outcomes at national level and the absence of sufficient data and information to train the AI algorithm in all languages can influence the matching results, with English currently offering the highest matching rate.
- Granularity and level of detail of ESCO skills in different sectors/fields can lead to different matching results according to the domain of a qualification. Traditional sectors saw better matching results compared to ICT or public sector qualifications. At the same time, the pilot provided relevant feedback on the granularity and reusability level of skills and on skills contextualisation.

- The link between individual learning outcomes of qualifications and ESCO skills allows for an indirect link with occupations, thus further enriching the information associated to a qualifications.

Next steps

Based on the results of the pilot project, the Commission proposes to extend the duration of the pilot to a second phase in order to test more qualifications and improve the functioning of the IT tool. Countries who participated in the first phase expressed their availability to continue the pilot and the Commission will issue a new call for expression of interest to reach out to other Member States.

DG EMPL is also exploring how to improve synergies with the existing initiatives implemented by CEDEFOP [on automated systems to compare VET qualifications](#) and by DG EAC (in cooperation with DGIT) Synergies which seeks to create links between higher education programmes (and their learning outcomes) and ESCO occupations.

Annex Workflow for the IT tool supporting automated linking of learning outcomes of qualifications to ESCO skills

Once entered in the tool's homepage, users can enter a qualification name or identifier and choose the language of the input text for automated translation. These two actions are optional but recommended: entering the name/identifier of the qualifications will help make the output more recognizable and picking the appropriate language, when a translation is needed, will help the system recognise the text. Under these two fields, users will find the main 'input box' where to paste the description text of the Learning outcomes.



Home > ESCO > Learning outcomes linking tool

Learning outcomes linking tool

name or identifier (optional)

Bachelor's degree in Informatics and Telecommunications Engineering

language

auto

- apply knowledge of mathematics and physics in the description, interpretation, resolution, and investigation of problems of informatics and telecommunications;
- recognize the individual building blocks of computer systems and telecommunications networks and know their role;



NEXT

Once clicked on the 'next' button, processing of the text will occur and users will be redirected to the 'select and export' page showing on the left window the individual learning outcome entities that were extracted from the input text. Users can further split or regroup the individual learning outcomes by clicking on the 'Modify' button.

name or identifier (optional)

Bachelor's degree in Informatics and Telecommunications Engineering

- apply knowledge of mathematics |
and physics | in the description, interpretation, |
resolution, and investigation of problems of |
informatics and telecommunications; |

By selecting an individual learning outcome, the user will instantly receive suggestions of ESCO KSC concepts provided by the machine learning algorithm, with the number next to each suggestion representing the 'vector distance' between texts., i.e the proximity between the meaning of the text and the suggested ESCO skill: smaller numbers correspond to a higher level of proximity according to the machine learning algorithm. By clicking on a suggested KSC, this concept will be automatically linked to the associated learning outcome.

Learning outcomes linking tool

Analysed text: Bachelor's degree in Informatics and Telecommunication Engineering

(English)

apply knowledge of mathematics and physics in the description, interpretation, resolution, and investigation of problems of informatics and telecommunications;

recognize the individual building blocks of computer systems and telecommunications networks and know their role;

MODIFY

Suggestions

Search

New

- [+](#) mathematics [↗](#) 0.44
 - [+](#) computational linguistics [↗](#) 0.46
 - [+](#) computer science [↗](#) 0.47
 - [+](#) philosophy of mathematics [↗](#) 0.52
 - [+](#) conduct quantitative research [↗](#) 0.52
 - [+](#) analytical methods in biomedical sciences [↗](#) 0.52
 - [+](#) physics [↗](#) 0.52
 - [+](#) geophysics [↗](#) 0.53
 - [+](#) biophysics [↗](#) 0.55
 - [+](#) behavioural science [↗](#) 0.55
- more results ...

Linked skills

Click the + button of a skill to link it to the selected text

EXPORT

The tool also offers users the possibility to search for KSC directly in the ESCO skills pillar, by switching to the manual search tab where they can edit the input text and see ESCO concepts related to it. Finally, in the event that users could not find a matching skill even by browsing the KSC pillar manually, the tool offers the possibility to propose a new concept by typing its label.

Learning outcomes linking tool

Analysed text: Bachelor's degree in Informatics and Telecommunication Engineering

(English)

apply knowledge of mathematics and physics in the description, interpretation, resolution, and investigation of problems of informatics and telecommunications;

recognize the individual building blocks of computer systems and telecommunications networks and know their role;

MODIFY

Suggestions

Search

New

If you are not able to find anything that matches the selected learning outcome, you can here propose a new skill that should be added to ESCO:

Name of the new skill

Supervised learning design

SUBMIT

Linked skills

- mathematics [↗](#)
- Supervised learning design (new)

EXPORT