

## SUMMARY

### IO5: ELIC Evaluation Process and Transferability Guide

The main goal of ELIC was to develop a specific training on technical content by means of a MOOC (Massive Open Online Course) for secondary school teachers of STEM subjects (science, technology, engineering, mathematics) who, once well-trained and armed with powerful resources, will have the chance to apply their new and improved competences directly in their daily work. These competences should help them to develop an engineering mind-set amongst pupils aged 15-18, thereby increasing their interest in engineering professions.

During the course of the project, the project partners implemented a complex structure summarized in the ELIC evaluation process and transferability guide with the following aims:

- to evaluate ELIC's core product, the ELIC MOOC, and improve it,
- to develop transferability options for other countries after the end of the project,
- to increase the knowledge on engineering and technical didactics in other countries and for further stakeholders,
- and to assure sustainability of the project outcomes.

To achieve these objectives, it was necessary to implement an evaluation and monitoring plan prior to the development of the contents of the ELIC MOOC to allow a constant verification of their quality, to compile an evaluation questionnaire for the MOOC participants, to verify facilitators' and moderators' problems as well as highlights during the MOOC development and implementation, and assess the final results that they could be more easily replicated in the future. For this reason, two different documents have been developed, the first one is called "ELIC Evaluation Process" and was defined and made available to partners before the beginning of the MOOC implementation process. The second document called "ELIC Transferability Guide" highlights first of all lessons learned and the applicability of the implemented MOOC and further gives advice and instructions on how to multiply and repeat the trainings in other countries and / or by other institutions.

#### IO5 Part 1 - ELIC Evaluation Process

The "ELIC Evaluation Process" document includes an overview of the MOOC explaining that the Engineering Literacy (ELIC) MOOC is an open educational resource (OER) aimed at secondary school teachers of science, technology, engineering and mathematics (STEM) subjects and providing the list of the 6 MOOC weeks foreseen by the Skill Card: Week 1 - Introduction to the MOOC and Engineering Literacy; Week 2 - E-Motor; Week 3 – Internal Combustion Engine; Week 4 – Battery & Light, the future of the automotive industry?; Week 5 - Hot topics in Engineering, What is new and challenging for the industry?; and Week 6 - Recap and certification, was it worth participating in the ELIC MOOC?.

In the evaluation process, the main point was the definition of evaluation and transferability criteria by detecting the quality standards (included in quality control and quality assurance) and describing the quality components. The transferability criteria for the MOOC were defined on two individual levels: general quality standards and output-specific quality standards, provided in a table with the following content:

- each output or document needed to define the MOOC,
- description of the specific quality standards,
- the activity to fulfil the quality control,
- frequency/deadlines and partners in charge.
- 

For the evaluation of the MOOC, different tools have been used according to the target groups addressed and to the processes in place. The partnership worked with internal peer reviews (for the main documents and contents), collected feedback (from project partners related to internal issues and problems faced to develop the MOOC and its piloting; to beneficiaries at different stages of the MOOC; to participants to Events disseminating the MOOC and final project results) and analysed and involved stakeholders to contribute to the project sustainability after the project's end.

The tools used to evaluate the process were: quality matrix for the internal peer reviews; external review of the MOOC piloting done by participants and available as an online questionnaire; feedback form for ELIC events (E5 – E8); internal review of the ELIC MOOC and future implementation; and tables for stakeholder analysis and involvement, which are all described in the document "ELIC Evaluation Process".

### **IO5 Part 2 - ELIC Transferability Guide**

The result of all the MOOC implementation carried out by the ELIC Strategic Partnership (8 partners from Austria, the Czech Republic, Germany and Italy), is the ELIC transferability guide.

The guide focusses on the project framework, the learning resources developed, the evaluation results, lessons learned and possibilities to use the MOOC in the classroom. Furthermore, it contains information about the learning platform itself and options for transferability to other contexts.

The document is designed to be used by institutions interested in offering their teachers or recent graduates online learning resources to improve their engineering competences, which in turn should help them to develop an engineering mind set amongst pupils aged 15-18 with a view to increasing their interest in engineering professions. In particular, secondary school teachers of science, technology, engineering and mathematics (STEM) subjects, higher education institutions, but also other education providers (adult education, vocational training) are targeted.

The guidelines include the project framework defined by summarizing the project background, by defining why partners decided to work on this issue, and by summing up the main project objectives.

The learning resources provided by the project are:

- the online course ELIC MOOC addressing engineering topics for teachers;
- a content 'Toolbox' for teachers;
- examples and experiments taken from automotive engineering;

- and an exam to receive the final certification.

A complete description of the MOOC, the target groups, expected outcomes and learning resources are explained. The feedback gathered from MOOC participants is outlined where it appeared that the overall evaluation of the MOOC was good. The detailed results provided essential comments regarding technical issues which were implemented wherever possible to improve the course.

75% of the respondents were men aged 36-55 years, teaching a variety of STEM subjects, all targeting students aged 14-18+ years. For them the platform is moderately or somewhat user-friendly, 83.3% attended all weeks with an effort between 11 and 30 hours.

For teachers the learning approach was less multidisciplinary than expected. More didactic input and more tools for the toolbox would have been desirable. Weeks 4 and 5 were deemed the most interesting ones.

Response levels may have been affected by the choice of English as the project language, thus it was agreed to translate summaries of the content into the national languages to aid understanding.

Facilitators and moderators had the opportunity to evaluate the MOOC anonymously using a questionnaire. Suggestions for improvement are included in the section "Lessons learned" of the transferability guide divided into preparation, implementation and final phase of the MOOC. Regarding the preparation phase it would be probably better to shorten the course and provide more quizzes, assignments and online questionnaires instead of having an open forum. The course timetable should avoid working on Sundays.

As regards the implementation, the workload for facilitators was very demanding especially during the MOOC content development. During the MOOC moderation the facilitators did not encounter any difficulties.

Participants hesitated to take the final certification exam, perhaps due to the fact that it is certified by an external body or because they were not confident in their grasp of the subjects dealt with.

Some teachers involved in the project and after dealing with the ELIC MOOC piloting phase, experimented and/or planned a practical phase following the course contents. Some examples and results coming from Austria, Germany and Italy are provided under "Possibilities to use the MOOC in the classroom".

The ELIC learning platform of the MOOC was created using the Content Management System (CMS) "Wordpress", a list of specific information is offered in the guide to host and maintain the MOOC. Technical information and support about the platform was given as well as the quality procedures and guidelines, the necessary preconditions about how to transfer the MOOC, how to access the platform and the certification criteria used.

The last for users and for the sustainability of the project is included in the section "Transferability options"

As previously mentioned, partners mainly organized: monitoring activities; collection of feedback from partners and participants of the project; options and opinions exchange meetings; targeted workshops.

"The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein." 2017-1-AT01-KA201-035034 – Engineering Literacy Online

In the last phase of the project a group of possible stakeholders has been involved, who could ensure a continuation of the activities carried out by ELIC. In addition, each partner has thought about how to support the project in the future by listing follow up activities that could be undertaken at local/regional/national levels. Finally, the guide defines some possible options on how to ensure sustainability of the project outcomes.

The list and information about the ELIC project partner institutions with contact persons is available in the Transferability Guidelines for further support.

To conclude, the project consortium wants to ensure that the products produced in the ELIC project can create a multiplier effect and can be implemented in different countries to increase the knowledge among the secondary natural sciences teachers on engineering and technical didactics. The project wants to equip secondary school teachers of STEM subjects with enhanced knowledge on engineering which in turn should help them to develop an engineering mind set amongst pupils to increasing their interest in engineering professions.

Further, the Evaluation Process and Transferability Guide gives advice and instructions on how to multiply and repeat the trainings in other countries and/or by other institutions.