

Report on European Evaluation Framework for Computing Education and Training 2020

(EEFCET 2020)

Francesco Tortorella, University of Cassino and Southern Latium, Cassino, Italy

Evaluation is a fundamental issue in any education activity. It can be defined as a systematic process that collects, analyzes, and reports well-founded information about the accomplishment of educational goals in order to correctly assess how an educational programme is effective. There is a strict interaction between teaching and evaluation in any education process. Independently of the quality of teachers, of the students and the teaching aids, the absence of a process aimed at assessing all the activities involved can make uneffective any educational effort.

This is even more true when dealing with Computing Education and Training where the subjects are rapidly changing and, in the same time, have a strong impact on the level of the productive sectors of a modern country.

In this context, EEFCET 2020 has been designed as an evaluation framework for European curricula and syllabi for BA, MA and doctoral level students in the field of computing. EEFCET 2020 aims at

- providing a tool for establishing shared and mutually recognised approaches, methodology, tools and indicators in order to assess the effectiveness of the computing curricula and syllabi from different point of views: planning, implementation and updating on institutional level;
- advancing the implementation of evidence-informed practices for quality assessment in the field of computing Education and Training by focusing on the knowledge, skills and competences gained by the university graduates at bachelor, master and doctoral level;
- providing the mechanisms for reporting and making recommendations to be used in the future design, implementation and improvement of computing curricula and syllabi;
- facilitating the sharing and implementation of changes based on the evaluation findings that will have an important impact on the quality and effectiveness of the computing curricula and syllabi and their sustainability;
- identifying a step-by-step process that links curricula planning, implementation and evaluation so as to strengthen the evaluation of computing Education and Training curricula and syllabi.

The objectives of EEFCET 2020 have been established on the basis of the outcomes of the FETCH work packages and are described as follows:

EO-1: Defining an evaluation procedure with corresponding content to evaluate the quality of curricula and syllabi in computing for bachelor, master and doctoral programs

EO-2: Planning the defined evaluation process for implementation and continuous improvement

EO-3: Implementing evaluation procedure in computing for bachelor, master and doctoral programs in European higher education institutions

EO-4: Continuous updating of established evaluation procedure in computing for bachelor, master and doctoral programs in European higher education institutions

Each objective involves the definition of some priority areas that serve as tools helping to correctly detail and accomplish the objective itself.

In particular, EO-1 includes the following priority areas:

- Stimulating the already established course evaluation processes in higher education institutions
- Stimulating the use of social media in the evaluation processes in higher education institutions
- Supporting the maintaining of the completeness and availability of curricula and syllabi in computing for bachelor, master and doctoral programmes for students and other stakeholders
- Moving beyond classroom or course evaluation processes to define a holistic post-use evaluation to facilitate a summative and formative evaluation of curricula and syllabi
- Identifying the strengths and weaknesses of the designed and implemented curricula and syllabi
- Emphasising on the definition and documentation of the evaluation processes in higher education institutions
- Emphasising on the independence of evaluation processes that can be related to changing curricula
- Emphasising on updating the evaluation processes based on the changes made to curricula and syllabi, especially on the definition level
- Emphasising on improving the evaluation processes in terms of the three factors: knowledge, skills and competencies
- Emphasising on the accountability of curricula and syllabi

For the objective EO-2 the following priority areas are defined:

- Stimulating the planning of already established evaluation procedures in higher education institutions
- Stimulating the updating and keeping up-to-date of plans of established evaluation processes in higher education institutions
- Moving beyond single point planning of evaluation procedures to an overall planning of curricula and syllabi
- Emphasising on the implementation and continuous improvement of the evaluation procedures in the higher education institutions
- Emphasising on referring to the lessons learned from previous evaluations on the planning process and on its improvement
- Focusing on the effectiveness and efficiency of the planning of the curricula and syllabi
- Emphasising on the effect the evaluation procedures have on the activities of the higher education institutions in terms of the decision-making processes on the planning of curricula and syllabi for computing education and training

The objective EO-3 has the following priority areas associated with it:

- Stimulating the continuous implementation of the already established evaluation procedures in computing for bachelor, master and doctoral programs in European higher education institutions
- Stimulating the updating of the continuous implementation of already established evaluation processes in computing for bachelor, master and doctoral programs in European higher education institutions

- Stimulating the involvement and motivation of all stakeholders in higher education institutions for the implementation of evaluation processes
- Focusing on improving the quality of education and training of computer scientists by implementing updated and well-planned evaluation processes in higher education institutions
- Emphasising on contributing to enhancing the overall learning of students in computing for bachelor, master and doctoral programs in European higher education institutions
- Focusing on involving the relevant staff (both academic and administrative) in the programme delivery, services and management with regard to their role in achieving the programme's goals and objectives
- Focusing on the impact resulting from the application of evaluation processes in the activities of the higher education institutions
- Emphasising on the evaluation of the commitment of the higher education institutions to respond to the needs of learners, stakeholders and the labour market in implementation and delivery choices of curricula and syllabi for computing education and training

The objective EO-4 includes the following priority areas:

- Stimulating the updating of the established evaluation procedures in computing for bachelor, master and doctoral programs in European higher education institutions
- Making all relevant stakeholders aware of the need for continuous updating of the evaluation procedures in higher education institutions
- Motivating all relevant stakeholders for updating the evaluation procedures in higher education institutions
- Emphasising on the continuous updating of evaluation processes to guarantee ongoing monitoring and evaluation of quality of computer education and training curricula and syllabi in higher education institutions
- Ensuring the updating of the implemented curricula and syllabi at institutional level regularly in line with the needs of learners, stakeholders and the labour market

On the basis of the objectives previously described, the architecture of EEF CET2020 has been defined in terms of

- inputs
- processes
- tools and resources
- outputs

The **inputs** for the whole evaluation procedure consider firstly the political and social environment in which the curriculum is delivered. In particular, the national and local educational policies, priorities and requirements must be identified and described in relation to computer education and training at higher education institutes.

The second type of input is given by the needs expressed by three categories of stakeholders: learners, representatives of IT industries, higher education institutes. Also in this case, their needs related to computer education and training which must be identified and described.

The third input is given by the capacities of the higher education institutes. The capacity of a HEI is given by the means available to the institute to accomplish its educative mission, mainly financial and human resources.

The fourth type of input includes all the data related to the fundamental aspects of the curriculum to be evaluated: aims and objectives defined in terms of knowledge/skills/competences; admission conditions; structure of the curriculum in modules; assessment procedures; quality assurance policies and processes; interim regulations.

The last input deals with the main issues to be considered when the curriculum is implemented: resources, in terms of information and learning material provided; processes, in terms of general services offered to the learner, learning activities and training support; results, in terms of course efficiency, knowledge increase and motivation to learn.

The **processes** include all the operations needed for gathering the input data, analyzing them according to the evaluation goals, and reporting valid conclusions. For a correct design of the operative steps to be performed, the *Plan-Do-Check-Act* cycle has been adopted as a reference model. On this basis, the following operational phases have been defined:

PHASE 1: The first phase is devoted to the evaluation of the **planning** of the curriculum. The main focus of the evaluation at this phase lies upon the assessment of the relevance of the planned programmes and syllabi to the priorities and policies of various target groups: external and internal stakeholders, future learners and society, as well as to the national and EU policies in the field of higher education.

PHASE 2: This phase includes the evaluation of the **implementation** of the curriculum. The focus here is to measure how the curriculum is operating as it was intended. In particular this phase aims at verifying to which extent the curriculum is carried out according to the legal and institutional regulatory requirements, the design architecture, the teaching and learning methods and approaches used, the assessment methods and procedures applied, the cost-effectiveness mechanism used, etc.

PHASE 3: The third phase comprises the **analysis** and **interpretation** of the collected evaluation data so that the effectiveness and efficiency of the curriculum is assessed both in terms of planning and implementation. The analysis considers the outcomes provided by the first two phases and provides essential information about the compliance of the curriculum to its objectives and the planned impact, of its strengths and weaknesses.

PHASE 4: The last phase entails the **review** of the results of the evaluation of the planning and implementation of the curriculum and plays a significant role in identifying the corrective actions for the improvement of the curriculum. The aim is to use the obtained findings to improve the curriculum according to the stakeholder needs.

In order to accomplish the described phases, several **tools and resources** are produced and used:

- **Checklists** guide evaluators and other stakeholders who are involved in the evaluation

process with instructions. They support among others decision-making processes since. For all four phases of the evaluation process checklists are provided by EEF CET 2020.

- **Surveys** help gather quantitative data from different stakeholders by asking the appropriate questions to the definition and implementation of curriculum at HEIs. EEF CET 2020 provides surveys for the phase 1 and phase 2 which are focusing on structured data capturing. Besides such questions to which stakeholders can answer with a score between 0 and 5 there are open questions for which text can be entered.
- **Interviews** help understand survey results by asking key stakeholders the rationale and background information for their answer. Interviews deliver qualitative data that can be used in combination with quantitative data captured by surveys for the analysis and interpretation of the data.
- **Visualisation tools** should be used to present the data gathered during the evaluation processes. EEF CET 2020 recommends the use of existing well-established tools for that purpose.
- **Document templates** help creating and adapting documents for own use during the whole evaluation process. EEF CET 2020 provides several document templates.
- **ICT competencies models** based on ICT labour market studies help in aligning ICT curricula towards stakeholders' needs

The **outputs** are provided in terms of reports. Five type of output reports are considered:

O1: Report on needs, capacities and policy analysis

O2: Evaluation report on the curriculum on definition level

O3: Evaluation report on the curriculum on execution level, including resources, processes and results from different stakeholders' points of view

O4: Detailed evaluation report aimed at analyzing and summarizing the issues identified in phase 2 and phase 3 with respect to the planning and implementation of the curriculum

O5: Evaluation summary report with recommendations for improvement including a score for each criterion and a total score for the whole computing education and training program

The approach adopted to design EEF CET 2020 is very appropriate and effective and leads to a valid evaluation framework for European curricula and syllabi for BA, MA and doctoral level students in the field of computing. EEF CET 2020 is systematic, continuous, based on evidence of information and aimed at making decisions about the curriculum so as to more completely accomplish the educational goals.

The definition of the EEFCECET 2020 objectives correctly derive from the two fundamental needs for improvement and accountability of the curriculum. As a matter of fact, EEFCECET 2020 is able to improve the effectiveness and efficiency of the planning and implementation phases of the curriculum as well as on the impact resulting from their application in the activities of HEIs and this in terms of the three factors: knowledge, skills and competencies. On the other hand, EEFCECET 2020 guarantees an accountability function that aims at holding all staff involved in the programmes delivery, services and management responsible for their role in achieving the programme's goals and objectives. In the same time, it also includes the evaluation of the commitment of the HEI to respond to the needs of learners, stakeholders and the labour market.

Another advantage of the proposed evaluation framework is its independence from a particular structure of the curriculum: this is a fundamental feature for an evaluation framework that should be applied to curricula defined in different HEIs of different European countries and should provide the possibility to make a comparison among them without any bias produced by the differences. However, EEFCECET 2020 is related to ESFCET 2020 and can be easily adapted for use in curricula created based on ESFCET 2020.



Prof. Francesco Tortorella

Dept. of Electrical and Information Engineering
University of Cassino and Southern Latium
Cassino, Italy