FRAMEWORK FOR STEM-CPD

A sustainable continuous professional development (CPD) framework for Science, Technology, Engineering and Mathematics (STEM) educators is developed in the STEM-CPD@EUni project.

Five elements

1. **CPD-Ambassador**
   is involved in higher education and promotes awareness of university STEM teaching competence, defines CPD needs of teaching staff, organizes professional development activities, and promotes CPD as a requirement for a sustainable quality of higher education teaching and learning.

2. **User Case**
   is a description of a CPD solution for a local teaching and learning challenge, a list of CPD goals, activities and materials, expected impact of the CPD solution on the quality of local educational practice, reflection / evaluation of the experiences, and a plan for possible follow-up.

3. **Scenario**
   clusters different user cases related to the educational competences and attitudes that are developed in the user case and the CPD activities that are used in learning environments.

4. **Summer School**
   is a week-long event with the aim of professionalizing CPD Ambassadors in the three dimensions: teaching competences, attitudes and using different types of CPD activities. The intended learning outcomes of each summer school are determined by the needs of the participants.

5. **STEM-CPD Community**
   is the community of CPD-Ambassadors. It encourages members to share knowledge and experiences and to support each other in their continuous professional development. It gives input to the Summer Schools.

Disclaimer: The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect 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.

Photos: copyright free or from Microsoft Stock and Unsplash (https://unsplash.com/).
Theoretical background

TPACK means Technological Pedagogical Content Knowledge framework. TPACK describes what knowledge lecturers need to have for successful teaching. Specifically, TPACK describes how the areas of knowledge interact with each other and influence one another in unique and specific contexts. The TPACK model was developed by Mishra & Koehler in 2006.

Explanation of TPACK in 3 minutes: https://youtu.be/0wGpSaTzW58

Constructive alignment

describes the course design in which intended learning outcomes, learning activities and assessment are aligned to each other (Biggs, 2011). This supports learners in effectively reaching the learning goals on the expected cognitive and skills level, and to become critical thinkers and reach deep conceptual understanding.

Community of Inquiry (CoI)

For effective learning online the following is indispensable:
(1) online courses need to stimulate cognitive involvement and active learning behavior of learners,
(2) a presence of a teacher (teaching matter) and a prompt feedback on the learning progress of individual learners,
(3) learning with peers in a social environment and giving peer-feedback to each other.

Disclaimer: The European Commission’s support for the production of this publication does not constitute an endorsement of the contents, which reflect 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.
Three dimensions of STEM-CPD

STEM-teaching Competences
- Constructive alignment
- Interactive teaching
- Problem solving in course design and teaching
- Engagement and motivation
- Feedback
- Organize Peer-feedback, collaborative learning
- Pre-knowledge gaps
- STEM specific topics
- Use of digital technology

Teaching Attitudes
- Motivation / inspiration
- Evidence informed approach
- Pastoral interest
- Reflection
- Knowledge sharing
- Giving peer-feedback
- Self-regulation (means here working on own development)

Type of CPD Activities
- Attending or giving presentations, workshops, webinars, conferences, summer schools about teaching and learning in HE, organized specifically for STEM lecturers and more general
- Following online courses / MOOC about teaching and learning.
- Getting peer-feedback on own teaching practice from a colleague
- Reading books / journal articles on teaching and learning in HE.
- Giving mentoring to a junior lecturer, getting mentoring from an experienced colleague
- Getting or giving just-in-time support on a specific teaching and learning issue, getting personal coaching / support by a pedagogical expert.
- Attending a professional development programme to get a teaching certificate in higher education
- Participating in a teaching and learning network or a special interest group on teaching and learning in HE.
FRAMEWORK FOR STEM-CPD

CPD environment and course design approach

Blended learning practice

is the environment in which STEM-CPD takes place. The lecturers learn at their “workplace” which means in the context of their own teaching practice. They can learn alone and independent online (asynchronous) or together with others in collaboration and co-creation in face-to-face or in online meetings (synchronous) situations.

ADDIE

is effective five-step instructional design approach: Analysis, Design, Development, Implementation, and Evaluation. ADDIE approach is used in STEM-CPD framework to design and develop microMOOCs and CPD activities. With this approach the needs of learners are determined in the step Analysis. A very important part of this approach is the evaluation. ADDIE can be a cyclic process. Based on the evaluation a new ADDIE cycle can take place to further improve the course.

Disclaimer: The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect 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.