



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.

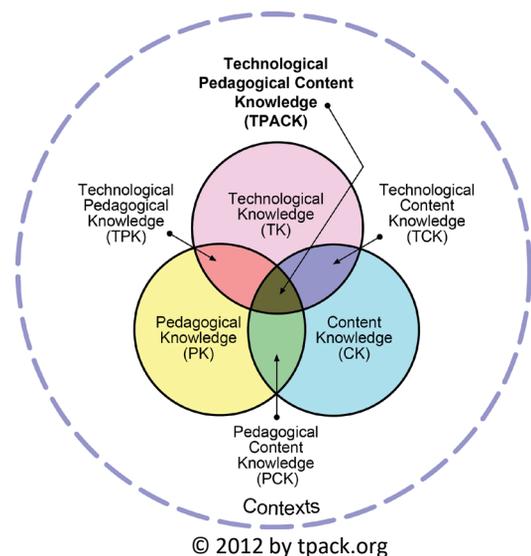




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Theoretical background



TPACK

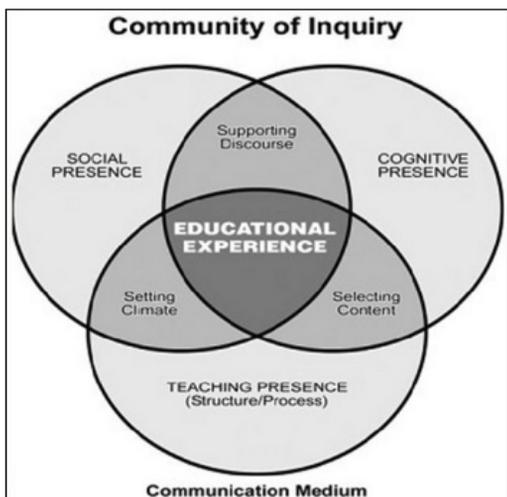
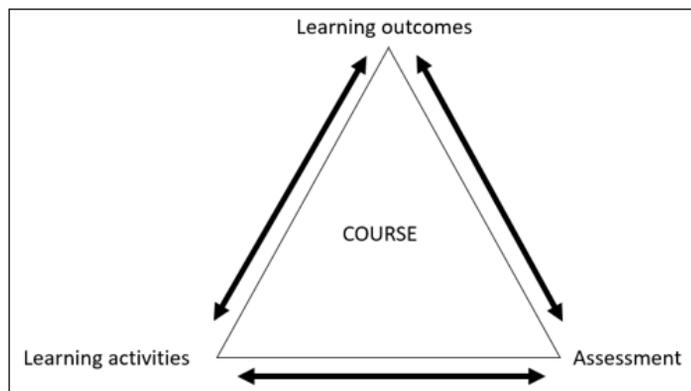
means **Technological Pedagogical Content Knowledge** framework. TPACK describes what knowledge lecturers need to have for successful teaching. Specifically, TPACK describes how the areas of knowledge interact with each other and influence one another in unique and specific contexts. The TPACK model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

Explanation of TPACK in 3 minutes:

<https://youtu.be/OwGpSaTzW58>

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.

Community of Inquiry (Garrison, Anderson & Archer, 2000)



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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

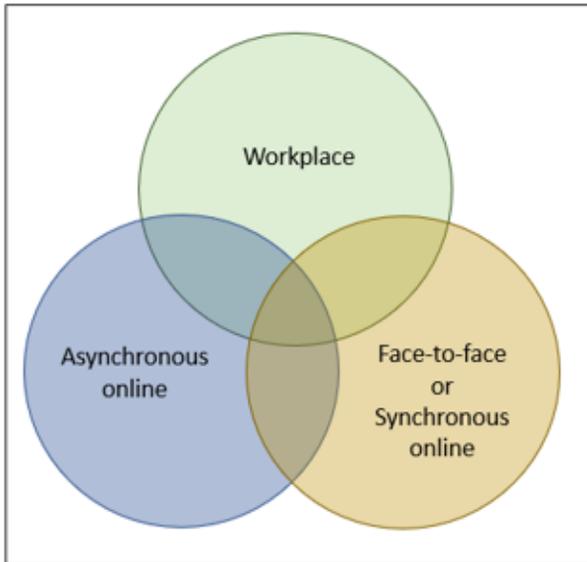
- attending or giving presentations, workshops, webinars, conferences, summer schools about teaching and learning in HE, organized specifically for STEM lecturers and more general
- following online courses / MOOC about teaching and learning.
- getting peer-feedback on own teaching practice from a colleague
- 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.



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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: **A**nalysis, **D**esign, **D**evelopment, **I**mplementation, and **E**valuation. 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.

