Implementation status of the STEM-CPD@EUniErasmus plus project

Nataša Brouwer[1], Iwona Maciejowska[2], Aleksandra Lis[2], Stefania Grecea[3], Johanna Kärkkäinen[4], Matti Niemelä[4], Krištof Kranjc[4], Črtomir Podlipnik[4], Sanjiv Prashar[6,7], Vincenzo Russo[8], Oreste Tarallo[8]

[1]Teaching and Learning Centre, Faculty of Science, University of Amsterdam, Science Park 904, 1098 XHAmsterdam, The Netherlands;

[2]Department of Chemistry Education, Jagiellonian University in Krakow, Gronostajowa 2, Krakow, Poland;

[3]Van 't Hoff Institute for Molecular Sciences, Faculty of Science, University of Amsterdam, Science Park 904,1098 XH Amsterdam, The Netherlands;

[4]Faculty of Technology, Research Unit of Sustainable Chemistry, University of Oulu, PenttiKaiteranKatu 1, Oulu,Finland;

[5]Faculty of Chemistry and Chemical Technology, University of Ljubljana, Večna pot 113, 1000 Ljubljana,Slovenia;

[6]European Chemistry Thematic Network, Rue de Stassart 119, Bruxelles, Belgium;

[7]Department of Biology and Geology, Physics and Inorganic Chemistry, ESCET, Universidad Rey Juan Carlos,Calle Tulipán s/n, E-28933 Móstoles (Madrid), Spain;

[8]Department of Chemical Sciences, University of Naples Federico II, Complesso Universitario di MonteSant'Angelo, Via Cintia, 80126 Naples, Italy.

Introduction

The European Chemistry Thematic Network (ECTN) is one of the 6 partners of the Erasmus Plus Strategic Partnership project STEM Continuous Professional Development at European Universities. This 3-year project is coordinated by the Faculty of Chemistry, Jagiellonian University in Krakow.

The project tackles the problem of the lack of subject specific training offered to University lecturers by working to promote the importance of Continuous Professional Development directed to the STEM disciplines (Brouwer et al, 2020). Members of the ECTN from Madrid, Perugia, Wroclaw and Bolivia, have been very active in the first year of this project taking part in the training events in Ljubljana (online) and Krakow (hybrid) Summer School, designing user cases and preparing microMOOCs. Through these initiatives we intend to set up a network of CPD ambassadors to spread the word initially at their home universities and then further afield.

STEM Continuous Professional Development at European Universities STEM-CPD @ EUni

During the first 18 months of the project two strands of activities have been undertaken:

1. Setup, development and optimization of project management structure, creation of repository, web page, dissemination strategy etc.

2. Work on all intellectual outputs simultaneously.

The aim of the first Intellectual output of the project (IO1) is to design a Roadmap on how to configure sustainable STEM continuous professional development (CPD) at universities in Europe and also knowledge sharing to empower lecturers in their lifelong learning and continuous improvement of the quality of courses and curricula in which they teach. We have designed and developed a survey for mapping the landscape across universities in different EU countries in order to define the priorities for CPD of teaching competences considering their expected impact. 420 Lecturers from 80 universities from 26 countries, and 46 educational managers from 31 universities from 11 countries in Europe have responded to the survey. Based on the results we have created recommendations and guidelines for the CPD activities at universities. The Roadmap is available at the following URL:
http://ectn.eu/wp-content/uploads/2021/06/Roadmap-Recommendtions-and-Guidelines-O1-April2021.pdf

It includes six recommendations with guidelines for the development in three dimensions: teaching competences, lecturers' attitudes and types of CPD activities. It includes a list of specific competences / attitudes / CPD-activities that were defined as the most important based on the survey results and provides the recommendations about the Summer school and the certification gives the guidelines onhow to approach user cases and online learning material for CPD-Ambassadors (i.e. the microMOOCs). The Roadmap established criteria for the selection of topics/context of the CPD activities, e.g. the impact on teaching and learning quality to develop user cases, scenarios and short online modules. The guidelines match the necessary train-the-trainer activities. The innovation is a co-creative CPD where teaching context is relevant for the development of university STEM-teaching competences and the pedagogical content knowledge of lecturers and where digital technology is used in a suitable way. This intellectual output has provided foundations for how to make relevant choices with respect to pedagogical technological content knowledge that university chemistry/STEM lecturers need to have when they work in the context of their own university and country.

The second result (IO2) of the project is a Framework for STEM-CPD. The aim of the intellectual output is development and description of a sustainable framework for continuous professional development for STEM university lecturers based on the principles of train-the-trainer approach and co-creation. The STEM-CPD framework has a pedagogical foundation in the TPACK model (Mishra and Koehler, 2003) that describes technological pedagogical content knowledge that lecturers need, Constructive alignment (Biggs and Tang, 2011) that defines course design, and ADDIE course development approach (ADDIE = analysis, design, development, implementation, evaluation).

The third output uses the STEM-CPD framework described in IO2 as a starting point for the preparation of the CPD activities collection, composed of STEM-CPD user cases and STEM-CPD scenarios. The CPD activities use a blended learning approach having three elements: asynchronous online learning, face to face training situations (e.g., workshops) or synchronous online and workplace learning. CPD scenarios cluster different user cases related to the educational competences and attitudes that are developed therein and the CPD activities

that are organized. A template for user case descriptionwhich includes context and goals, relevant information and elements for the implementation of CPD activities and section for the evaluation and reflection has been designed. Based on this, we have developed an online form for collection and description of the STEM-CPD user cases on the Starfish platform,which is an open source, open content, online platform for CPD development based on the principles of the TPACK framework. Starfish has a network approach to knowledge sharing where a large variety of entities can be connected by tags. All descriptions are tagged according to four TPACK elements: content, pedagogy, technology and context. The form to share knowledge on Starfish, i.e., User cases form is openly available with registration for those people involved in higher education. The shared material on Starfish is freely available for everybody. Following the template and using the Starfish form, each partner has designed their first CPD User case which led to the collection of first six STEM-CPD User cases. Online handbook (version 1), with examples of STEM-CPD user cases in Starfish and the Manual how to find the collection of User Cases online and how to use the Starfish template. https://starfish-education.eu/. Peer evaluation gave valuable information for the developers and based on the feedback the User Cases were modified and improved. User cases developed by the CPD-Ambassadors of the first summer school are currently being implemented in their local universities.

The fourth output (IO4)-a collection of short, open online modules for CPD of HE lecturers in STEM is being created. For these modules, specific topics of interest have been chosen as defined and prioritized in the Roadmap (O1). According to the guidelines proposed in the Roadmap (IO1), a template for design and development of short open online modules, so called microMOOC, has been produced.It is available on the web page: https://micromoocs.eu/moodle/course/view.php?id=2#section-7.

The LTT Workshop "How to design a MOOC" with internationally renowned lecturers took place on-line between 17th and 20th February 2021 under the auspices of the Faculty of Chemistry and Chemical Technology. University of Ljubljana (Slovenia). Based on the experience of such LTT educational materials have been produced, including the Book of abstracts (available at: https://micromoocs.eu/moodle/mod/scorm/view.php?id=79).The six microMOOCs, constituting the first phase, havebeen prepared.

- Bridging pre-knowledge gaps
- Communication between students and academics
- Better evaluation with students' peer assessment
- How to design innovative on-line continuous self-evaluation tests
- How to elicit misconceptions
- Continuous online assessment: Strategies for large classes

The group from Ljubljana has set up a new web page (https://ectnmoocs.eu) which is dedicated to the collection and deployment of all microMOOCs developed during the STEM-CPD@EUni project. It is based on the open edX and thus enables hosting microMOOCs that can possess all the desired interactive components. Additionally, by having our own platform we can tailor many parameters to the advantage of our particular uses.

The fifth output (IO5) is the course design of summer schools. The first version of such a programme has been proposed and an extensive description of the course design of the summer school has been created. The first Summer School took place from 10th to 15th of October 2021 in Krakow and online (hybrid format). 32 Participants from Finland, Italy, the Netherlands, Poland, Slovenia, Spain, and further afield in Bolivia took part in the 1st Summer School of the Erasmus+ Project STEM-CPD@EUni. In a friendly atmosphere of a beautiful Polish city, representatives of 12 European universities met at the Faculty of Chemistry, Jagiellonian University or on-line to prepare themselves as future CPD Ambassadors. Theirrolewill beto promote, motivate and organize continuous professional development of lecturers in their local environment (department, institute) and, based on such activity, become members of a larger European STEM-CPD community, sharing knowledge and experience in education.

In order to achieve this goal, the participants were subject to an intensive training program, which resulted in the creation of the so-called user cases, where they have to indicate the way of proceeding in various didactic situations in the teaching process in STEM fields at university level.

The Programme, consists of 19 workshop style sessions (about 40 teaching hours) including:

- Challenges in teaching and learning
- Why to use Constructive alignment approach in student T&L and CPD?
- Constructivism and inquiry-based science education
- Blended and online learning course design. How to design a mMOOC?
- Collaborative teaching and learning and CPD activities – Can't I do it myself?
- Shift from teaching to learning in higher education. Student-centered learning approach
- How to design user cases and scenarios?

The was all complemented by a rich additional program, including visiting the laboratories and museum of the Faculty of Chemistry of the Jagiellonian University and visiting the city of Kraków.

The goal of Summer School was to active student-centred teaching and learning practice and person-centred CPD and to stimulate cooperation in a sustainable way via the CPD-Ambassador community. All materials to be downloaded by the participants of the summer school are available online when needed on the Jagiellonian University e-learning platform KRAKUS and will be openly available after the summer school in a special section of the official STEM-CPD@EUni project website.

The O6 Evaluation framework of STEM CPD is led by the Jagiellonian University in Krakow (project coordinator and grant holder) with particular support from the University of Naples and contributions from all other partners, especially IO leaders for IO1 (University of Amsterdam), IO3 (University of Oulu) and IO5 (University of Naples). In the reporting period we developed a final version of the Evaluation Protocol, which is published on the project's website as one of the project's results. The protocol contains the aims, detailed description of dedicated audiences, as well as evaluation questions, methods, tools and strategy for gathering data.

Invitation

Project development is progressing correctly, and our next big event is the Second Summer Schoolin Naples in October 2022. We invite all ECTN members who wish to contribute to this project to enrol in this activity and prepare themselves to be CPD-ambassadors.
https://ectn.eu/work-groups/stem-cpd-o5/

Literature

Biggs, J., Tang, C. (2011). Teaching for Quality Learning at University, 4th ed., New York: Open University Press.

N. Brouwer, I. Maciejowska, A. Lis, C. Machado, S. Grecea, J. Kärkkäinen, M. Niemelä, K. Kranjc, Č. Podlipnik, S. Prashar, V. Russo, O. Tarallo. The Need for STEM Continuous Professional Development at European Universities. VIRT&L-COMM **2020**, 21. ISSN: 2279-8773.

Mishra, P., Koehler, M. J. (2006). Technological pedagogical content knowledge: a framework for teacher knowledge. Teachers College Record, 108(6), 1017-1054.

STEM-CPD@EUni

http://ectn.eu/work-groups/stem-cpd/