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WP 4 – Establishment of CPD scheme and vocational training

D4.3 Preparation of CPD scheme implementation plan report

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About TeacHy

As the FCHT industry gradually emerges into the markets, the need for trained staff becomes more pressing. TeacHy2020, or short TeacHy, specifically addresses the supply of undergraduate and graduate education (BEng/BSc, MEng/MSc, PhD etc.) in fuel cell and hydrogen technologies (FCHT) across Europe.

TeacHy2020 will take a lead in building a repository of university grade educational material, and design and run an MSc course in FCHT, accessible to students from all parts of Europe. To achieve this, the project has assembled a core group of highly experienced institutions working with a network of associate partners (universities, vocational training bodies, industry, and networks). TeacHy offers these partners access to its educational material and the use of the MSc course modules available on the TeacHy site. Any university being able to offer 20 to 30% of the course content locally, can draw on the other 80 to 70% to be supplied by the project (and its successor entity that will support the platform post-project).

This will allow any institution to participate in this European initiative with a minimised local investment. TeacHy will be developing solutions to accreditation and quality control of courses, and support student and industry staff mobility by giving access to placements. Schemes of Continuous Professional Development (CPD) will be integrated into the project activities. We expect a considerable leverage effect which will specifically enable countries with a notable lack of expertise, not only in Eastern Europe, to quickly be able to form a national body of experts.

TeacHy will offer some educational material for the general public (e.g. MOOC's), build a business model to continue operations post-project, and as such act as a single-stop shop and representative for all matters of European university and vocational training in FCHT. The project partnership covers the prevalent languages and educational systems in Europe. The associated network has over 70 partners, including two IPHE countries, and a strong link to IPHE activities in education.

Deliverables Abstract

Parallel to the Masters Programme development, which is the mainstay of the TeacHy project, we have intended to use the same course material for Continuous Professional Development courses for external participants.

This deliverable summarises the approach and implementation plans for these activities and briefly describes the modifications that were made to the original plans in the course of the TeacHy project CPD delivery.

1 Relationship of MSc and CPD teaching material

1.1 Approach

The education delivered at university for a Masters programme (MSc) corresponds to the 'Level 7' educational level according to European nomenclature. When speaking about training and up-skilling in Continuous Professional Development (CPD) courses, the level is in general Level 6 (for trained technicians, equivalent to a university Bachelors programme level) and Level 7 (engineers, thus equivalent to MSc programme level at university).

The TeacHy project therefore unsurprisingly took the approach to use the MSc programme material developed and delivered in the TeacHy project as the base material for CPD course delivery outside of the university. The difference in teaching/learning between students and external participants would be made up by the professional experience and background of the external participants, and the wider background they would be able to draw upon in engaging with new learning materials.

1.2 Implementation Plan

Table 1 shows the list of the modules offered in TeacHy. All of these modules were implemented at the university of Birmingham and at the same time also registered as external courses, i.e. CPD modules. Modules in 4th Year of studies (Meng degree programme) and MSc programmes are generally delivered in 'short and fat' mode, which means the modules are taught during one week, mostly followed by a week off with time for the students to revisit lectures and work on the coursework. This is in contrast to the undergraduate teaching which is generally 'long and thin', i.e. delivering the lectures and tutorials across all weeks of the semester.

As a first approach, the university modules as run and timetabled for the MSc students, were also opened up for external participants. The marketing was performed by the University of Birmingham external courses marketing staff.

2 CPS course delivery at University of Birmingham

2.1 Learnings and modifications

It quickly appeared that external participants to modules have a different time management, specifically will practically always be working alongside attending the lectures and tutorials, effectively being part-time students. This does not sit well with a module that is taught full-time, meaning it requires around 6 to 8 hours of student attention per day.

This resulted in external participants only attending/viewing a minority of lectures, not turning up to tutorials at all, and not delivering any coursework. As the content was available online, the response to enquiries as to their whereabouts was generally that they would catch up at a later point in time.

In order to accommodate for this new insight, we decided to separate the CPD module delivery from regular university student timetabled modules. Currently all CPD modules are delivered across several weeks in order to give participants sufficient time to view material and prepare for the tutorial sessions.

Table 1: TeacHy MSc modules and their respective course codes for CPD delivery at University of Birmingham.

No.	Title	CPD course code
C1	Introduction to Electrochemistry	683G
C2	Fuel Cell Technologies and Applications	945E
C3	Hydrogen and hydrogen-based fuels	010F
C4	Fuel cell modelling tools and control	t.b.d.
C5	Characterisation methods	011F
C6	Fuel Cell and Hydrogen Lab	n/a
C7a	Principles of Hydrogen safety	External
C7b	Hydrogen safety	t.b.d.
O2	Low temperature fuel cells	681G
O3	High temperature fuel cells	682G
O4	Fuel Cell systems	t.b.d.
O5	Advanced electrochemical applications	012F
O8	Fuel cell electric vehicles	679G
O9	Hydrogen Markets and Policies	t.b.d.
O10	Energy systems and storage	t.b.d.

2.2 Bespoke courses

The other insight was that the content as compiled in the MSc programme modules often did not correspond to the needs of Level 7 external learners. As these would have a developed professional background already and have very specific needs in upskilling for a specialist job, discussions on content to be delivered to companies mostly ended up with firstly a mish-mash of MSc modules as listed in Table 1, picked and mixed to the needs of the customers, and secondly, the addition of lectures on topics not covered in the MSc modules. The development of such content was facilitated by the modular approach we had taken to the TeacHy modules (Fig. 1) so that single lectures could be taken from modules, re-arranged into new Teaching Units to then be delivered in CPD context.

The interesting insight from this exercise was that participants from professional backgrounds are far more critical than university students, are more sensitive to English language issues (as many company customers will be international and their staff not English native speakers), and are much clearer in voicing their needs and giving feedback (positive and negative) to the teaching delivery. The latter makes it far easier to respond to issues raised in the short term and mending them as the module is actually being rolled out.

Insofar the university modules (Table 1) have greatly benefited from the delivery of the same and similar material for CPD purposes.

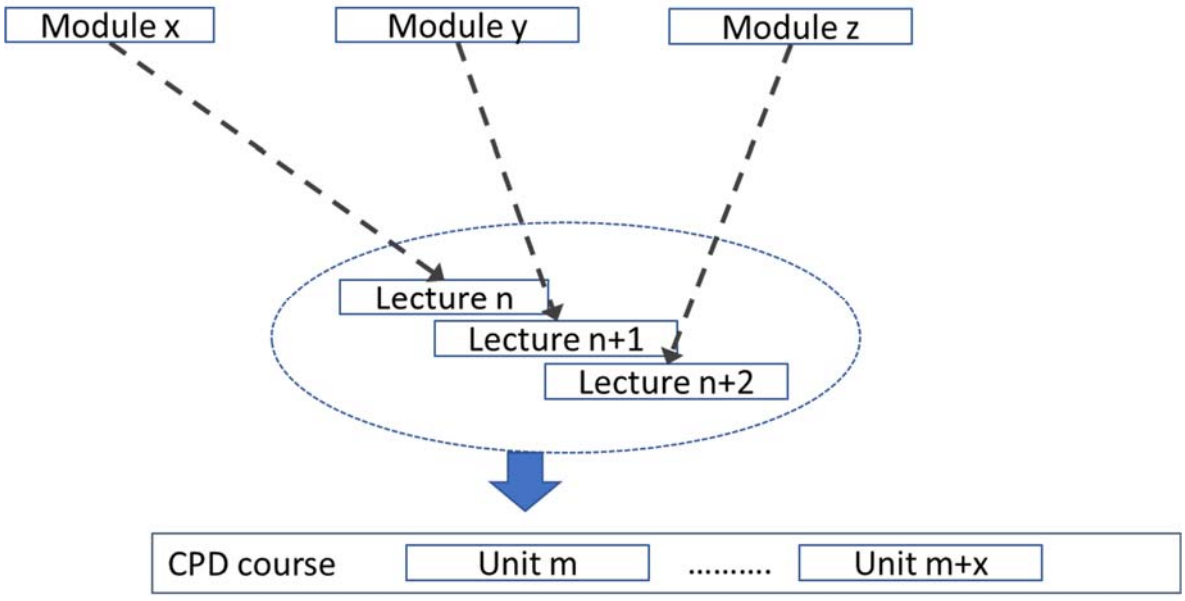

Fig. 1: Principle of picking and mixing content, either whole modules, teaching units, or single lectures from the TeacHy repository of material.

3 CPS Delivery at other universities

3.1 Lifelong learning programme at ULB

ULB and VUB decided at the end of 2021 to develop a life-long learning programme on “Hydrogen applications and technologies” based partly on the resources developed in the TeacHy project. This University certificate corresponds to 10 ECTS (88h) and will be taught over a period of 10 months (one afternoon per week). This programme aims to train candidates with a higher-education degree in science and/or technology, who are or would like to be active in the hydrogen field. Candidates could be young graduates, professionals who want to make a transition towards hydrogen systems or non-employed people who want to reorient themselves professionally.

Several types of profiles have been envisioned:

1. An "explorer - student" type profile, for example a young graduate interested in hydrogen and wishing to develop his expertise to pursue his career in this growing field.
2. An "innovator - scientific expert" type of profile, for example an engineer in a design office or in a company, responding to the needs of companies for whom the implementation of a new hydrogen sector or project requires specific knowledge and skills.
3. A "decision-maker - manager" type profile, for example in a large industrial company in mobility/heat, following the evolution of the energy transition in a permanent way to facilitate the transition in his company.
4. A "policy-makers - responsable in administration" type profile in charge of setting regulations and enforcing them in the household companies. the administrations involved in energy and environmental regulations.
5. An "epistemophile" type profile, for example a Science or Technology alumni who wishes to be educated on the global energy transition.

3.2 CPD courses at Grenoble-INP

Courses are regularly being conducted for industry customers, e.g. for Air Liquide, based on the university module material, but (as at UoB) delivered independently of the university teaching.

3.3 CPD courses at Rijksuniversiteit Groningen

With the move of Prof Aravind Purushotaman-Vellayani from TU Delft to Rijksuniversiteit Groningen (RUG), the TeacHy activities were partly also transferred.

At RUG the hydrogen module material was used for training students and externals in two course runs in 2020 and 2021.

4 Summary

CPD courses were initially planned using the identical material as the TeacHy MSc modules. Integrating the external participants into university timetabled module delivery proved to not be the most viable idea and was hardly compatible with the schedule of most external participants.

CPD modules were therefore separated from university teaching and delivered over an extended period of four to six weeks.

A second approach was chosen for bespoke teaching for companies wishing to arrange for training courses for their staff. In these cases lecture material from MSc modules was selected and re-packaged to bespoke teaching units for the external customers.