
IHE DELFT'S DIGITAL EDUCATION TRANSFORMATION

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Introduction

IHE Delft Institute for Water Education (<https://www.un-ihe.org>) is the largest international graduate water education facility in the world, having provided graduate education to more than 15,000 water professionals from over 162 countries, since its creation in 1957. The Institute is based in Delft, The Netherlands, offering fully accredited MSc degrees, PhD degrees in collaboration with partner universities, summer courses and short tailor-made trainings in specific topics. Online education products are also part of the Institution's educational portfolio, namely accredited online courses that mostly originate from the MSc programmes, a Graduate Professional Diploma Programme (GPDP) and an OpenCourseWare (OCW) platform with free open educational resources.

The pedagogical model is based on active learning, engaging learners in real world problems. IHE Delft provides a highly contextual learning experience, contributing to the development of essential skills to analyse and solve global water challenges. The Institution promotes critical thinking, preparing learners for trans-disciplinary (involving non-academic stakeholders) challenges associated with the complex water issues in the real world. Studying at IHE Delft is considered a life-changing experience for its learners by exposing them to an intercultural environment, characterized by plurality and diversity of ideas, experiences and disciplines. The implementation of the programmes is characterized by a high degree of transparency, openness, flexibility and inclusiveness (IHE Delft, 2018).

Part of IHE Delft's mission is to contribute to the education and training of professionals. Embracing the opportunities of digital technologies, IHE Delft intends to expand its online efforts, making education more flexible and accessible to learners worldwide. In this way, the institution is undergoing an internal reflection, analysing needs, implementing processes and exploring possibilities to improve education and enrich its portfolio with the use of digital technologies. We use the term *transformation* in our title as it reassembles an organizational shift (Nwankpa & Roumani, 2016), where for instance, collecting and understanding data is critical to continuously improve the quality of our working processes, educational practices and products.

In this paper we present our online education products, a reflection on the development of Massive Open Online Courses (MOOCs) as an upcoming new product and where it stands in

our offering, the implementation of an online course development process to improve quality, and finally a reflection about the future of education at IHE Delft.

Online Education Products

Accredited Online Courses

IHE Delft offers accredited online courses (<https://www.un-ihe.org/online-courses>) for professionals in the water sector who hold a Bachelor Degree in a relevant field of study, allowing our learners to study part-time, without interrupting a day-time career. A workload of 140 hours is distributed throughout 4 months, requiring a time investment of approximately 8 hours per week to complete the learning activities and study the educational resources. In these courses learners have the opportunity to interact with fellow participants, while guided by a Module Coordinator (content expert) who gives support and personal feedback.

Several new courses are under development, to be offered as single courses and/or part of new GPDP.

Graduate Professional Diploma Programme (GPDP)

The online GPDP (<https://www.un-ihe.org/graduate-professional-diploma-programme>) in Sanitation and Sanitary Engineering consists of a sequence of four or five accredited online courses, and was created for learners who wish to specialize professionally in the field, without having to commit to an MSc programme. In order to obtain a diploma, learners need to reach a minimum of 20 credits (ECTS), which equals a workload of 560 hours, to complete in 1.5 (minimum) to 4.5 (maximum) years. Personalization is an added value of our GPDP, since the curriculum is selected based on the learners' needs – each learner has a personal study plan, designed in collaboration with a study advisor.

Because of the success of this flexible and personalized programme, new GPDPs are being developed to be offered in the next academic year.

OpenCourseWare (OCW)

The main objective of IHE Delft's OpenCourseWare (<https://ocw.un-ihe.org>) is to contribute towards lifelong learning and fulfilment of our mission regarding knowledge sharing with the international practitioner and scientific community, and project partners. The Institute is committed to help solving the world's water crisis by educating the water leaders of the future, mainly from developing and transition countries. The demand for water education by far exceeds the number of professionals that IHE Delft can train and OCW helps to bridge this gap, allowing professionals and students to access open educational materials, in a format that is designed for self-study.

Currently, IHE Delft has 18 courses available as OCW and is planning to gradually expand its volume over the coming years. Typically, these courses include: lecture notes, lecture presentations (PowerPoint), video-lectures and examples of exercises, tools, models and/or public domain software.

By using a Creative Commons license (CC-BY-NC), partner institutes, educators and the general public have the opportunity to use, re-use, and/or redistribute these open resources for non-commercial purposes. Consequently, these educational materials are benefiting a much larger audience and as such, increasing substantially their impact worldwide. This licence is chosen to further optimise the use of course materials and to encourage educators around the world to make use of these open resources.

Massive Open Online Courses (MOOCs)

The status report on “MOOC Strategies of European Institutions”, published by the European Association of Distance Teaching Universities (EADTU), indicates that offering flexible learning opportunities and increasing institutional visibility are the main objectives for Higher Education Institutions (HEIs) offering MOOCs (Jansen & Konings, 2017).

IHE Delft's main goals regarding open education is to reach a worldwide audience and to have high impact in developing and transition countries. While increasing institutional visibility would be a valuable addition, we believe that this goal is highly dependent on where MOOCs are offered. In other words, high visibility is easier achieved when MOOCs are placed in one of the big providers, namely Coursera, edX or FutureLearn. Taking this into account, IHE Delft realizes that in order to offer MOOCs, two distinct scenarios have to be explored before taking this important next step:

- The scenario in which we publish our MOOCs on our own website and develop them on our own learning management system (Moodle), building on internal expertise. This would require a lower initial investment, although our courses would be limited to our own network.
- The scenario in which we offer our MOOCs on a well-known platform with millions of users such as edX or FutureLearn. This would require a higher initial investment (paying the provider's fee), with the advantage of reaching a much broader audience and receiving course development and production support.

IHE Delft is expected to launch its first MOOCs in 2018. Whatever the scenario, offering MOOCs will definitely have an impact on our existing offering. Looking at MOOCs as a new product, we can see that it fits between our accredited online courses and our OpenCourseWare initiative, since they'll be released with an open license but at the same time allow certification for a certain fee (Table 1).

Table 2: Summary and main characteristics of IHE Delft's existing online products, including the upcoming MOOCs

	Graduate Professional Diploma Programme (GPDP)	Accredited Online Courses (MSc level)	MOOC	OCW
Admission requirements	Yes (BSc)	Yes (BSc)	No	No

Workload	560 hours 1.5 – 4.5 years (combination of 4-5 accredited online courses)	8 hours/week 4 months	4 – 6 hours/week 1 – 2 months	Flexible
Pricing	Tuition fee	Tuition fee	Open (small fee for the certificate)	Open

Course Development Process

At IHE Delft, Online Education is coordinated by the Education Bureau, a process management unit responsible for organising the educational programmes and for coordinating the processes of innovation in education and quality management. Implementing a course development process is ongoing, in collaboration with the Information and Technology unit. This process holds 4 stages and is expected to last approximately 10 months, from starting the project to creating the course, delivering and evaluating it (Table 2).

Table 2: Course development process with 4 stages and represented as a timeline

Month	1	2	3	4	5	6	7	8	9	10
Stage	Envision	Design & Create				Deliver			Evaluate	

Although we represent it as a continuum timeline, course development is executed as an iterative process, especially in the *Design & Create* stage, where course content is designed, created and tested before moving into full production. The ending *Evaluation* stage feeds back in order to improve any of the previous stages of the process. The following topics describe the main activities in each stage:

- *Envision* – a shared vision is established between the course team, who sets roles and responsibilities, project deadlines, describes the course and defines the main learning objectives to meet the target audience's needs.
- *Design & Create* – a course design is produced in order to make learning objectives, assessment, learning activities and resources aligned and explicit. After a course topic/unit is designed, created and tested, full production takes place. A final check is done before the course is ready to launch.
- *Deliver* – a trained online tutor delivers the course by providing guidance, feedback and support, anticipating and solving problems, facilitating participation and motivating learners throughout the course.
- *Evaluate* – feedback from learners is collected using surveys and learning analytics are used to produce a report that will lead to a list of possible actions and/or improvements for the next run of the course.

An e-Learning expert from the Education Bureau is assigned to execute the process with the course teams, facilitating several workshops, providing guidance and support in the different stages. In order to provide a more efficient support, a number of trainings is offered periodically related to course design, content creation, course implementation in the learning management system and an online tutoring course. This approach not only allows us to offer a more consistent support, but also to promote sharing experiences between different course teams.

Future Challenges at IHE Delft

IHE Delft is a campus based institution with a history of online education efforts, initiated by highly motivated academic staff. Several initiatives are ongoing and new products are being considered that will definitely enrich our portfolio, allow us to reach a broader audience and at the same time contribute to the improvement of our educational practices. At a pedagogical level our academic staff develops courses based on the university teaching qualification (UTQ) guidelines, aligning topic structure, learning objectives and formalizing assessment. Offering more online education and improving it is seen as a natural next step.

Our short term plan is to widely implement the course development process, contributing to increase the quality of our support and ultimately the quality of the educational products that we offer. We believe that a well-established process will allow us to optimize the development of online courses and contribute to its consistency. Although this implementation has already started, time is needed to consolidate before it's seen as a standard process in the Institution.

Another upcoming challenge is to start offering MOOCs. At the moment, we have several in the pipeline that involve multiple partners, which adds more complexity. The new course development process will definitely be useful in these upcoming projects, where straightforward guidelines and effective project management are required to keep the development on track.

Regarding MOOCs, we expect a natural growth of this product in the coming years, since it fits our mission to offer flexible and open education to a worldwide audience. Hence another interesting development would be to use the same strategy with MOOCs, as used when combining several accredited online courses at IHE Delft to offer a GPDP. This combination of MOOCs could develop to flexible micro-credential programmes (Cabral, Jorge, & van Valkenburg, 2017), and perhaps inverted admissions into IHE Delft's campus Master's programmes in the future.

OCW is another initiative we want to see growing, and we expect MOOCs to have a positive impact on this matter. Although we still see some resistance to openly share our courses, it's important to motivate a change towards a culture of sharing to avoid that it becomes a barrier to OCW. Once this culture of sharing course materials is incorporated within the IHE Delft staff members' and partners' routine, and based on the lessons learned up-to-now, we believe that it will be possible to scale-up the number of open educational resources made available in OCW faster in the coming years.

Another challenge is to make IHE Delft's MSc programmes on campus more flexible. The programmes consist of 14 sequential Modules, each running for a period of 3 weeks. The workload is intensive, consisting of lectures (including guest lectures) and practical activities. A blended learning design would be a viable alternative, combining best practices in both online and face-to face methods (Adams Becker et al., 2017). This approach could make the programme more flexible, enrich the learners' experience and allow lecturers and learners to make better use of contact time in a more meaningful way.

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