Developing best practice in university laboratory education

Nataša Brouwer

7th Eurovariety, Belgrade, June 28-30th, 2017
Developing best practice in university laboratory education

Open Online course

Why?

How?

Structure

Development
Faculty of Science

All Science disciplines
- ~4000 students
- ~1000 staff members
  >350 lecturers UTQ

Research
- 8 research institutes / PhD Schools

Education
- College of Science
  - 11 bachelor programmes
- 3 Graduate Schools
  - 40 master programmes
  - PhD programmes (teaching part)
- Institute for Interdisciplinary Studies
- Education service center

7th Eurovariety, Belgrade, June 28-30th, 2017
University Teaching Qualification Programme Faculty of Science

- 2007 newly appointed lecturers
- 2012 all teaching staff
- 2007-2017 > 350 lecturers UTQ certificate (80-90%)
# Dutch University Teaching Qualification Framework

<table>
<thead>
<tr>
<th>Lecturer’s Competence</th>
<th>UTQ certificate</th>
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<tbody>
<tr>
<td>Professional approach</td>
<td>- teaching, students and colleagues</td>
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<tr>
<td></td>
<td>- own performance and professional development</td>
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<td></td>
<td>- student’s learning process</td>
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<tr>
<td>Design of teaching</td>
<td>course design</td>
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<tr>
<td>Teaching</td>
<td>teaching, assessment and evaluation within one course</td>
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<tr>
<td>Support and supervision</td>
<td>support of students during and outside lecture hours</td>
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<tr>
<td>Development and organization of education</td>
<td>organisation of a course in collaboration with colleagues</td>
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Open Online course

Aims

- bring together lecturers from different countries
- about how to design and how to teach
- discuss about best practice in laboratory teaching
Undergraduate laboratory courses

- laboratory courses central and distinctive role in science education
- poorly articulated goals claim understanding of:
  - materials
  - phenomena
  - concepts
  - models
  - relationships
- disconnection curriculum – assessment
- difficult to introduce changes in lab courses
  - high costs in time and money
  - teaching / faculty beliefs
- lecturers professional development

Undergraduate laboratory courses - ambition

Developing best practice in university laboratory education

Open Online course

Aims

- improve university laboratory teaching and learning practice
- share best practice in laboratory teaching
- European+ context
ECTN consortium brings together all the actors in chemistry / chemical engineering in Europe through the membership of the partner associations.
ECTN – European Chemistry Thematic Network

- universities
- national chemical societies
- CEFIC (European Chemical Industry Council (30,000 companies))
- EuCheMS (European Association for Chemical and Molecular Sciences, members are all European National Chemical Societies),

- 29 EU countries, including the Republic of Serbia and Macedonia
- 6 third countries
ECTN – European Chemistry Thematic Network

Basic tasks

Mapping and enhancing education
- teaching methods (professional development)
- teaching materials
- quality assurance activities

Facilitating European Co-operation
- assessing the quality of European co-operation
- tools for co-operation (ECTS, new models of co-ordination, Europeanization strategies)
- promoting the production of European modules

ECTN Approach: Working groups
Developing best practice in university laboratory education

Open Online course

How?

- ECTN working group
- design within and for community
- European+ context
ECTN Working Group
Lecturing Qualifications and Innovative Teaching Methods

Developing best practice in university laboratory education

Survey and interviews
■ What is the learning problem?
  • according to lecturers
  • according to students
■ What do lecturers wish to learn?

How many of you …

- teach
- teach in lab courses in higher education
- research in chemistry education
- management
Lecturers

What are the most important learning problems of students who follow the lab classes at your faculty?

> 40 lecturers from 16 institutions from 8 countries

- preparation before the lab session (lack of theoretical knowledge)
- integration of theory and experiment work
- application of theory (apply calculations in practice and vice versa e.g. dilution of solutions)
- lack of motivation
- don’t recognize purpose of the experiment
- lack of inquiry skills
- hands-on but not minds-on
- large differences in background knowledge
- overload
Students
What are main difficulties during lab courses?

150 students Jagiellonian University’s Faculty of Chemistry
paper-based, semi open questions

Bachelor students
• time management (66%)
• data / measurement error analysis (52%)
• lack of experience in experimental work (30%)

Master students
• data and measurement error analysis (47%)
• drawing conclusions (32%)
• setting up complex apparatus (32%)
• distribution of tasks team work (37%)
• anxiety dangerous experiments
• time consuming readings and reports
What lecturers wish to learn?

- How to design active learning for the lab sessions?
- What do I do with a new laboratory course that I am required to teach?
- How to design an assignment and how to grade it?
- How to conduct classes showing routine procedures so as to make them interesting?
- What is a role of the demonstrators/GTAs in helping and mentoring students?
ECTN Working Group
Lecturing Qualifications and Innovative Teaching Methods

Online course
Developing best practice in university laboratory education

active learning  student centred

hands on and minds on
Target audience of the online course

- lecturers who teach in lab courses
- lecturers in the bachelor
- relatively inexperienced lecturers
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Set up online course

- SPOC (Small Private Online Course), open to apply for target group => MOOC ((Massive) Open Online Course)
- 6 modules
- 6 weeks
- work load 2 hours / week
- learning activities / assignments, types: read, watch video, polls, discussions, write/design, peer-feedback
- assessment (certificate / (open) badge)
Framework design: Constructive Alignment and TPACK

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Structure Online Course – six modules

Module 1: Motivation, welcome and introduction
Module 2: Learning theories and theories in practice
Module 3: Teaching skills and strategies: The good laboratory teacher
Module 4: Giving instruction: questioning and support
Module 5: Assessment and Feedback / Reflection on teaching
Module 6: Case studies

Pilot trial version: November 2017
Example learning outcomes

Module 1: Motivation, welcome and introduction

When you have completed this module you will be able to:

■ explain why we should have laboratory classes

■ describe and compare different types of laboratory session with a focus on expected learning outcomes

■ provide strategies on how to increase student engagement during demonstrations and hands on practical sessions.

Pilot trial version: November 2017
State of development online course

- Theoretical framework
- Extent
- Target participants
- Structure of the course
- Design of the course:
  - Intended learning outcomes
  - Types learning activities
  - Assessment possibilities
- Collect/select teaching material
- Types and design of assignments
- MOOC platform - Coursera
ECTN WG Lecturing Qualifications and Innovative Teaching Methods

Core development team
- WG leader
- 3 module coordinators
- members

Ways of collaboration
- shared Google drive folder
- online videoconference / two weeks
- position paper published

Working group – core members

- Nataša Brouwer (UvA) - WG Leader
- Gunther Fleerackers (UC Leuven-Limburg, Belgium)
- Iwona Maciejowska (Jagiellonian University in Krakow, Poland)
- Mauro Mocerino (Curtin University, Perth, Australia)
- Nineta Hrastelj Majcen (EuCheMS, EU)
- Claire McDonnell (DIT, Ierland)
- Erwin Rosenberg (TU Vienna, Austria)
- Pita Vandevelde (AP University College, Antwerp, Belgium)
- Michal Wozniakiewicz (Jagiellonian University Krakow, Poland)

- > 20 members, followers who give feedback
**Working group members followers, give feedback**

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<th>No.</th>
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<th>Affiliation</th>
<th>Country</th>
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<tr>
<td>1</td>
<td>Pilar Bermejo-Barrera</td>
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<td>2</td>
<td>Anne-Marie Billet</td>
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<td>Gabriella Borzone</td>
<td>University of Genova</td>
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<td>Peter Childs</td>
<td>University of Limerick</td>
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<td>Gino Paolucci</td>
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Thanks for your attention!

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