

Inquiry-based learning, SSIs and intercultural learning

Summerschool Utrecht 2022

Michiel Doorman

Vincent Jonker

Monica Wijers

Schedule

09:00-11:00	Part 1 - Workshop IBL - redesign
11:00-11:15	Break
11:15-12:00	Part 2 - Lecture on IBL and SSI
12:00-13:30	Lunch
13:30-15:00	Part 3 - Workshop SSI
15:00-15:30	Break
15:30-17:00	Afternoon Working group



International Centre for STEM Education

Part 1 - IBL

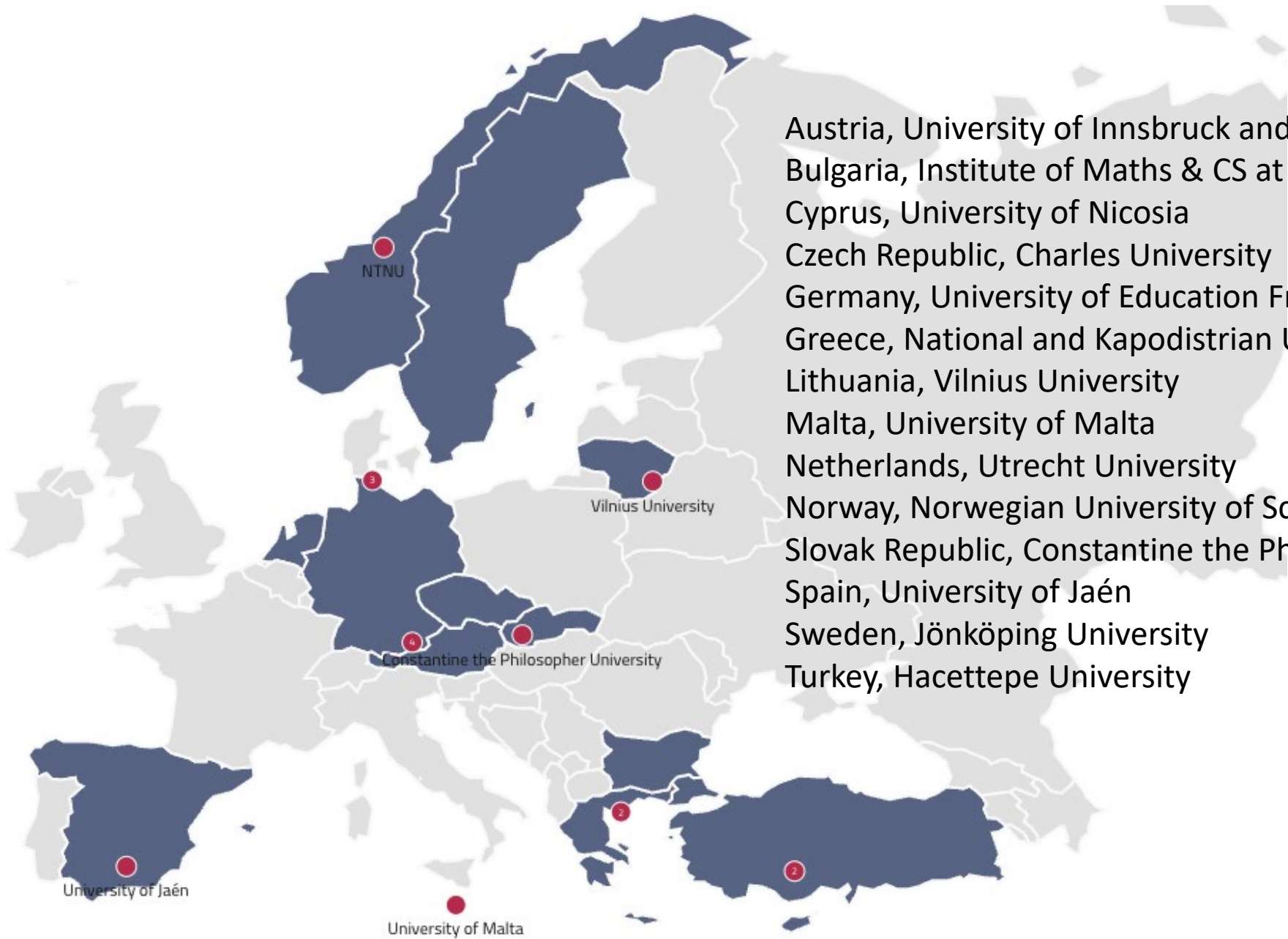
09:00-11:00

Part 1

- About ICSE
- An IBL example – drug concentration
- Redesign
- Redesign guidelines

International Centre for Stem Education (ICSE)

- STEM – Science Technology Engineering Mathematics
- an internationally connected research centre that is located at the University of Education in Freiburg, Germany. The ultimate aim of ICSE is to help improve STEM education across Europe through practice-related research and its transfer into practice.



- Austria, University of Innsbruck and University of Klagenfurt
- Bulgaria, Institute of Maths & CS at the Bulgarian Academy of Sciences
- Cyprus, University of Nicosia
- Czech Republic, Charles University
- Germany, University of Education Freiburg and IPN in Kiel
- Greece, National and Kapodistrian University of Athens
- Lithuania, Vilnius University
- Malta, University of Malta
- Netherlands, Utrecht University
- Norway, Norwegian University of Science and Technology
- Slovak Republic, Constantine the Philosopher University in Nitra
- Spain, University of Jaén
- Sweden, Jönköping University
- Turkey, Hacettepe University

MaSDiVTM

MOSTTM

STEMkeyTM

ncluSMeTM

Primas



GEMTM

teach4life

ENSITETM



Assessment
Contexts
Design research
Embodied cognition
Informal-formal
Inquiry based learning
Mathematizing (horizontal-vertical)
Model of → model for (emergent modelling)
RME
Own productions
Problem solving
Progressive schematization

Valued outcomes

- Inquiring minds
- Applying science in real life
- Preparing for active citizenship and lifelong learning
- Understanding the nature of science
- Understanding how mathematics and science are used in the World of Work

What students do

- Inquire, pose questions
- Explore problems, engage in solving them, use their knowledge to find solutions
- Explain situations and phenomena
- Reflect on the results and processes
- Make sense for themselves
- Explore the World of Work

Teacher guidance

- Values and builds upon pupils' reasoning and reflections
- Connects to pupils' experience
- Motivates students by connecting school and work

Classroom culture

- Shared sense of purpose/justification
- Value mistakes, contributions (open-minded)
- Dialogic
- Shared ownership
- Collaborative

IBL tasks

- The context is meaningful
- The situation evokes multiple solution strategies
- The students plan inquiry
- The task supports collaboration and communication

World of Work

- The **context** of the task relates to the WoW
- Students have to take a professional **role**
- Students' **activities** reflect workplace practices
- The task asks for a **product**



Exploring

- Explore the textbook task on Drug Concentration
- Discuss:
 - Content and skills needed to solve this problem
 - Characteristic of the task
 - Elements of inquiry based learning (IBL)
 - Aspects related to diversity
 - Other relevant aspects

Exploring, next step

- Explore the IBL version of the task on Drug Concentration
- Discuss
 - Content and skills needed to solve this problem
 - Characteristic of the task
 - Elements of inquiry based learning (IBL)
 - Aspects related to diversity
 - Other relevant aspects

Sharing findings

Redesigning - theory

Brainstorm on:

- what steps can be taken to redesign a textbook-task
 - into an inquiry-based task (1)
 - that has opportunities to address diversity (2)?

Redesigning - practice

- Select one or two of the textbook-tasks (copies).
- Redesign these into an 'IBL-task' including elements to address diversity

Share and discuss

- What went well?
- What was challenging?

Checklist for IBL

- Does the task give students the opportunity to inquire and pose questions?
 - Is the task unstructured or partly structured?
 - Does the task start with the 'whole' problem
 - Is the task not broken down in subquestions
- Does the task give students the opportunity to explore problems and engage in solving them?
 - Are questions open ended?
 - Can multiple solution strategies be applied?
- Is the task set in a rich context?
 - Is more information available about this context (video, pictures, artefacts, a professional from this field, a workplace nearby)
- Does the task provide opportunities for working collaboratively?
- Are students given a concrete role?
 - Is this role made clear to them?
 - Do students have to deal with constraints?
 - Can the work be divided within a team?
- Is the task aimed at producing something?
 - Is this product useful (purpose and utility) for an audience?
 - Does the product fit the context, activities and role?



Part 2

11:15-12:00

Lecture on IBL and SSI



Part 3

13:30-15:00

Workshop on SSI

- Climate Change
- Ecological Footprint



International Centre for STEM Education

Other

Bronnen

- Ensite
 - ecologische voetafdruk (www.fisme.science.uu.nl/toepassingen/28926/)
 - Temperatuur
(www.fisme.science.uu.nl/toepassingen/28928/)
- Mascil

Online repository freudenthal.nl



● MODULE

Waterquality: Swim without risk?

Students will investigate how water quality can be determined

Age: 15-18
2012 - 2.620 views



● WORKSHEET

Chocolate Chip Mining

A practical, problem-solving activity linked to analysis of data about copper mining.

Age: 11-15
2013 - 2.918 views



● WORKSHEET

Design a parking garage

Working as an architect: parking in the basement

Age: 11-15
2013 - 2.837 views



● LESSON

Circular pave-stones backyard

A packing problem

Age: 11-18
2013 - 1.350 views

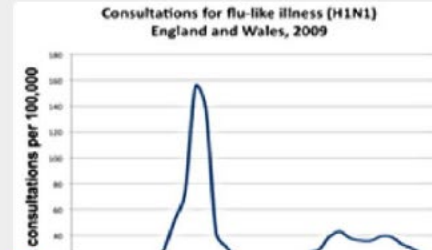


● MODULE

Emergency calls: immediate response success rate

Interpret the data about the immediate response success rate

Age: 11-15
2013 - 1.029 views



● MODULE

Epidemics: modelling with mathematics

Understanding the use of vaccination in preventing the spread of epidemics.

Age: 11-15
2013 - 1.561 views