ENERGY ANALYSIS FOR SUSTAINABLE CITIES

Padova, 02.04.2025 | **Michele De Carli, Mohamad Hasan Khajedehi**

Didactic Model

(COIL = Collaborative Online International Learning)

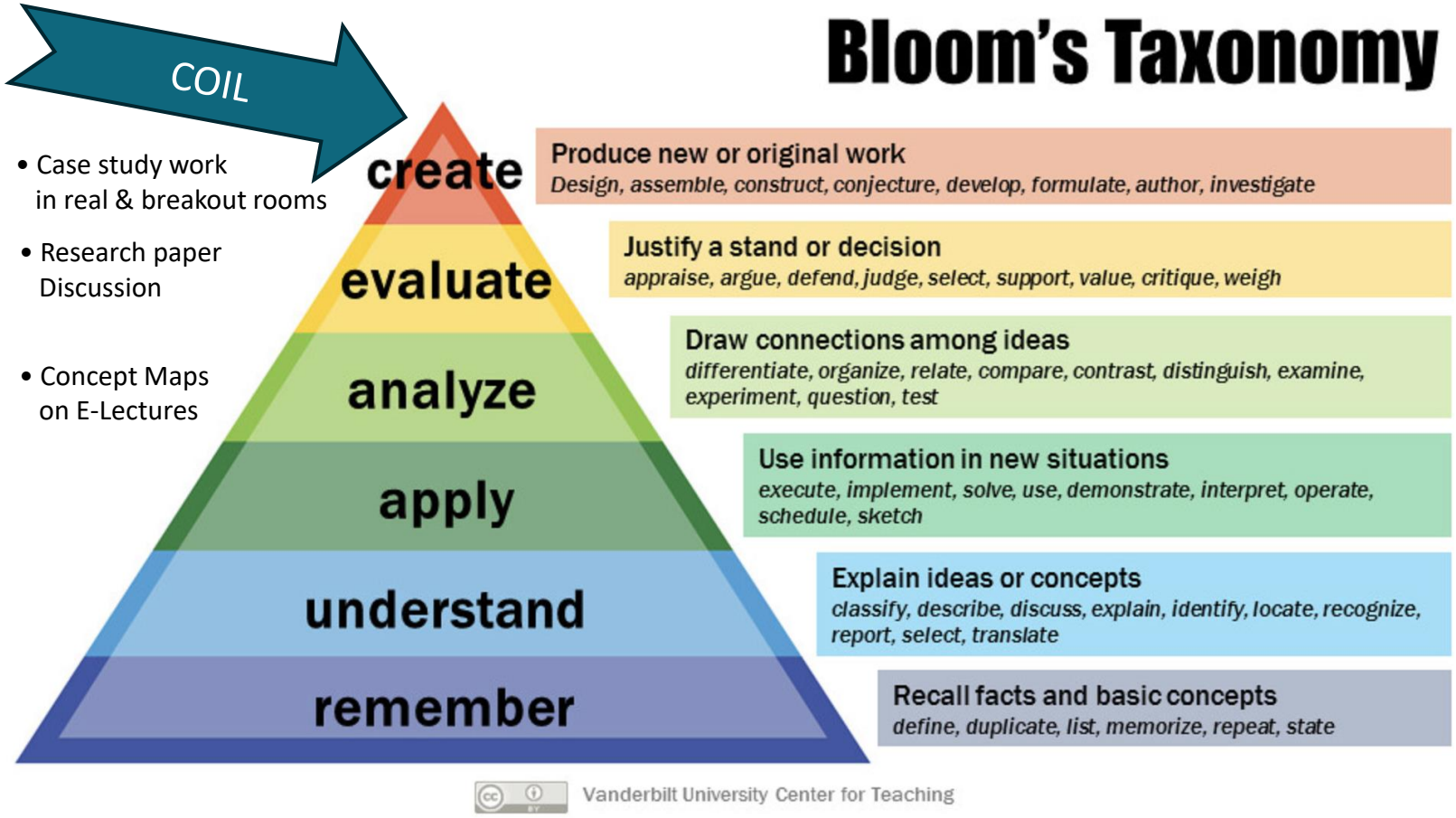
Seminars

Exercises

E-Lectures

COIL

- Case study work in real & breakout rooms
- Research paper Discussion
- Concept Maps on E-Lectures



Source and details see: https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

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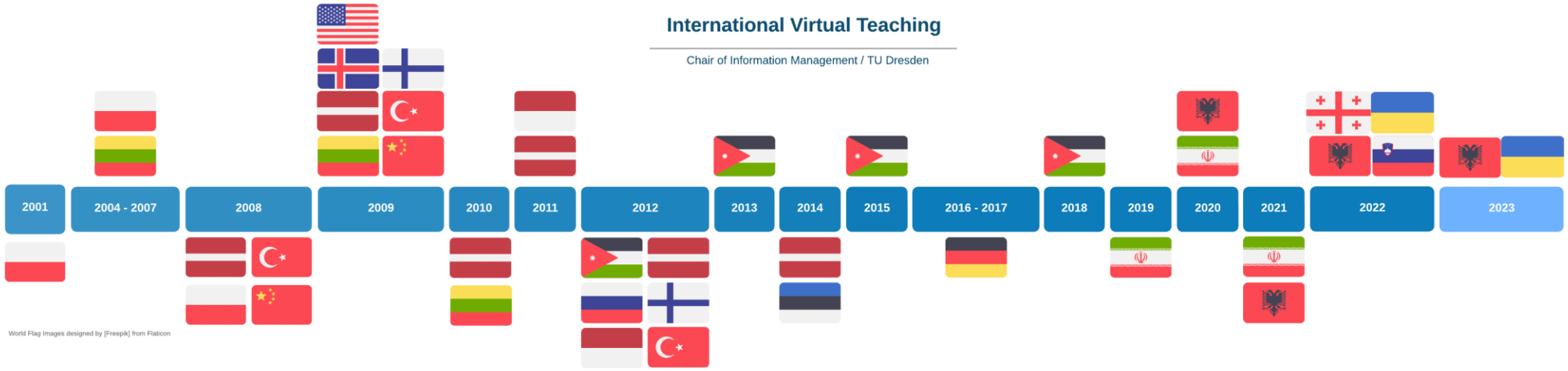
VCL (Virtual Collaborative Learning)

- Virtual = online, using new communication channels
- Collaborative = in groups, benefitting from the experience of others
- Learning = gaining new knowledge and experience



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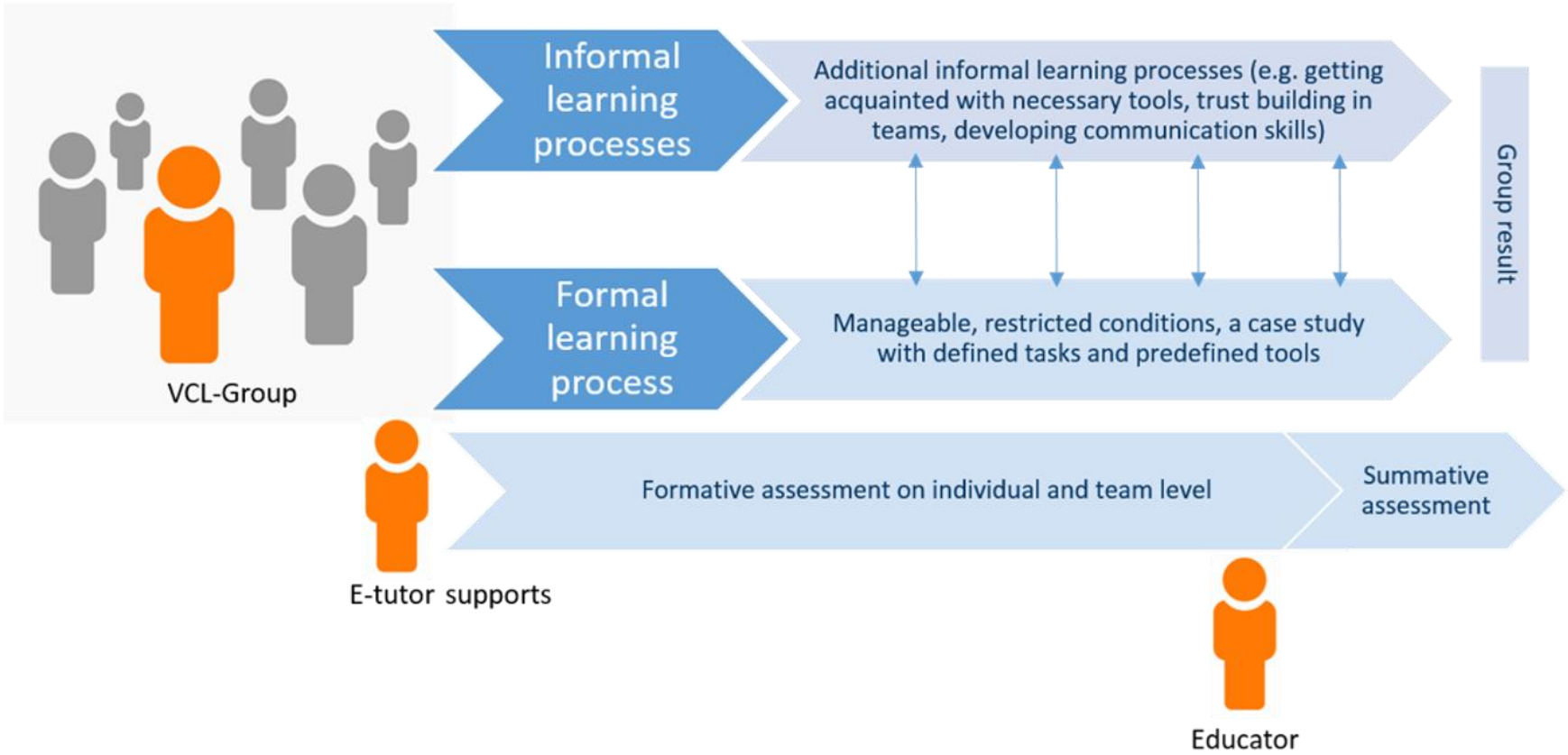
Introduction to VCL theory

Virtual Collaborative Learning Framework



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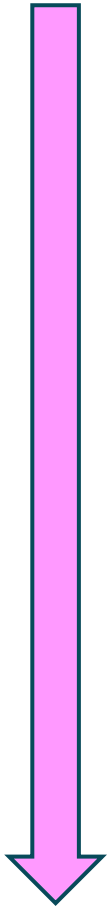
Project: time and effort

Time Frame	Description of the Tasks	Online Meetings
Week 1: Intro April 07 – April 14, 2025	Introduction to the case study, team members, MS Teams and e-tutors	**Kickoff Meeting** 07.04.25 16:00 – 18:00 CET
Week 2: IT Case April 14 – April 23, 2025	Introduction to Geographic Information Systems (GIS), including data collection methods, storage formats, and spatial analysis. Hands-on use of QGIS and OpenStreetMap to extract and process building data, apply elevation statistics, and generate geojson files.	–
Week 3: IT Case April 23 – April 30, 2025	Fundamentals of Building Energy Modeling (BEM), covering principles of heat transfer, energy balance, HVAC systems, and simulation processes. Includes collecting building and climate data, calculating U-values, and estimating heating and cooling needs.	**Practical Workshop** 23.04.25 16:00 – 18:00 CET
Week 4: IT Case April 30 – May 07, 2025	Urban Building Energy Modeling (UBEM) using simplified steady-state calculations. Involves assigning building properties, calculating surface areas, volumes, and heat transfer coefficients, and estimating city-scale heating demand. Scenarios for improving energy efficiency are developed.	**Interim Presentation** 07.05.25 16:00 – 18:00 CET
Week 5: UA Case May 07 – May 14, 2025	Assessment of the current condition of buildings and energy infrastructure in a war-affected model district in Ukraine, including analysis of energy demand, vulnerabilities, resilience, and renewable energy potential.	–
Week 6: UA Case May 14 – May 21, 2025	Development of a roadmap for complex renovation and decarbonization, focusing on energy-saving measures, renewable integration, urban energy efficiency optimization, and smart grid solutions to improve resilience in Ukraine.	**Final Presentation** 21.05.25 16:00 – 18:00 CET



April 7 2025

May 7 2025

May 21 2025

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Course Objectives

- Develop competencies in GIS for spatial data analysis.
- Apply BEM techniques to assess building energy performance.
- Utilize UBEM for large-scale energy consumption analysis.
- Benefit from international collaboration and teamwork through a virtual learning environment.
- Engage with real-world data and tools to propose energy-efficient solutions.

Successful participation is graded with open badge (next academic year 3 ECTS)

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Registration

Register via the following QR-Code!

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