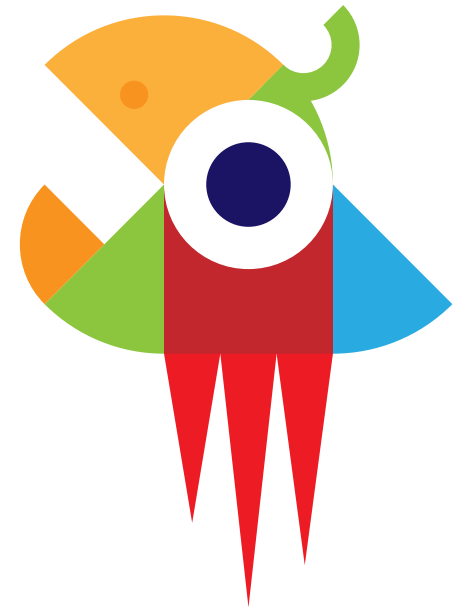


DBL Example:
AERODYNAMIC CONCEPTS: drag
and lift forces for wing profiles



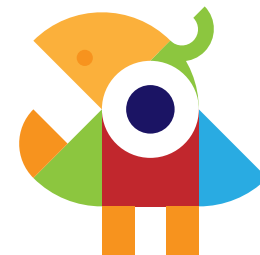
01.

Design Criteria of the DBL Activity

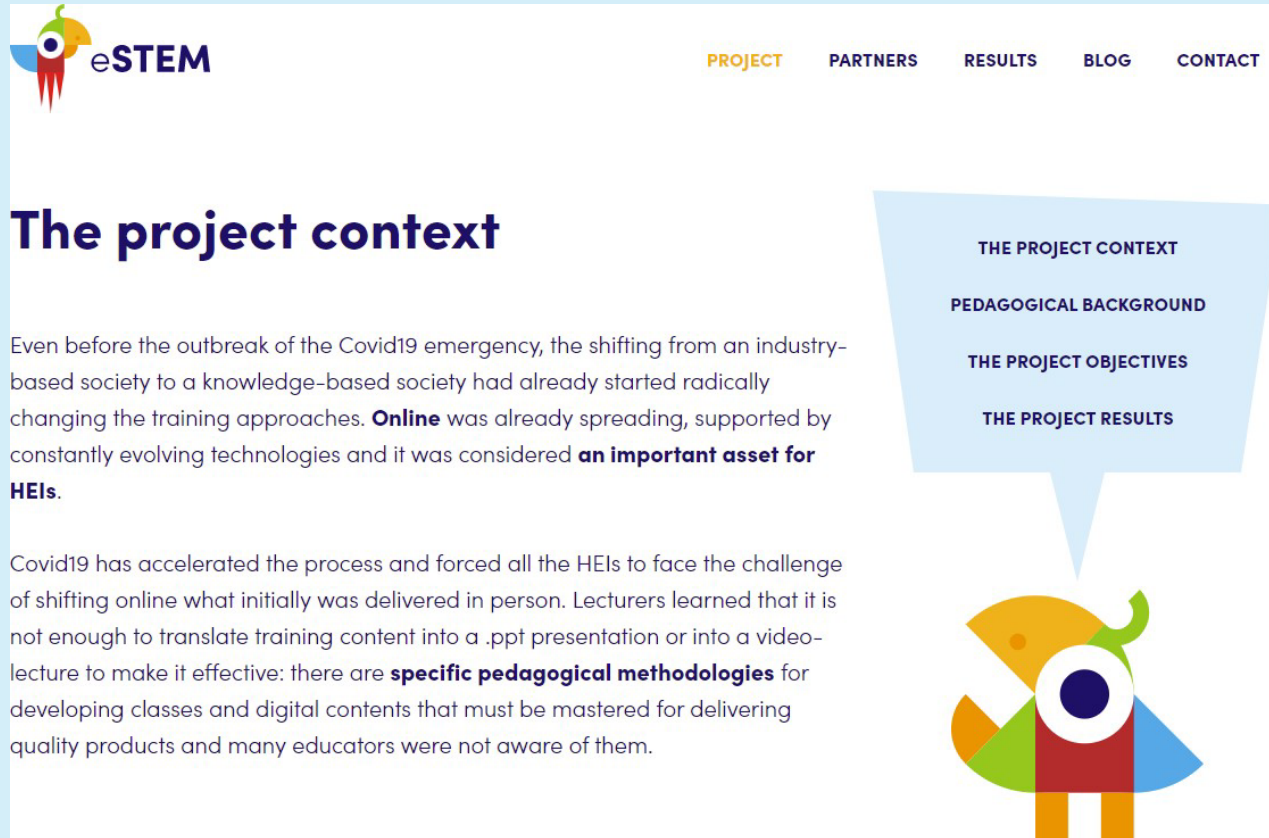


European Project eSTEM

- <http://www.superfastlearning.eu>
- Development and implementation of action-based learning lectures.
- eSTEM is designed for HEI lecturers and educators (academic professors, researchers, etc.) belonging to STEM Faculties.
- 4 active pedagogical methodologies: inquiry-based, problem-based, scenario-based, **dataset-based learning**



European Project eSTEM



The screenshot shows the eSTEM website with a navigation menu (PROJECT, PARTNERS, RESULTS, BLOG, CONTACT) and a main heading 'The project context'. The text discusses the shift to online learning and the importance of pedagogical methodologies. A blue callout box on the right lists the page's content: THE PROJECT CONTEXT, PEDAGOGICAL BACKGROUND, THE PROJECT OBJECTIVES, and THE PROJECT RESULTS. A colorful robot character is positioned at the bottom center of the screenshot.

eSTEM

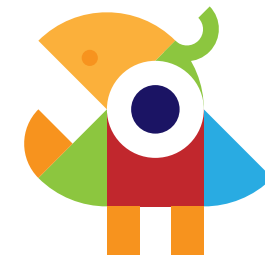
PROJECT PARTNERS RESULTS BLOG CONTACT

The project context

Even before the outbreak of the Covid19 emergency, the shifting from an industry-based society to a knowledge-based society had already started radically changing the training approaches. **Online** was already spreading, supported by constantly evolving technologies and it was considered **an important asset for HEIs**.

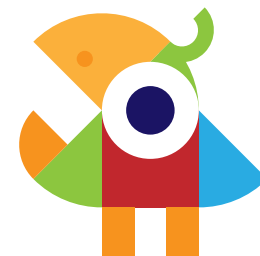
Covid19 has accelerated the process and forced all the HEIs to face the challenge of shifting online what initially was delivered in person. Lecturers learned that it is not enough to translate training content into a .ppt presentation or into a video-lecture to make it effective: there are **specific pedagogical methodologies** for developing classes and digital contents that must be mastered for delivering quality products and many educators were not aware of them.

THE PROJECT CONTEXT
PEDAGOGICAL BACKGROUND
THE PROJECT OBJECTIVES
THE PROJECT RESULTS



Lecture context

- Subject: Fluid Mechanics
- Degree: Bachelor degree of Mechanical Engineering



Intended Learning Outcomes (ILOs)

- Understanding fluid flow and forces
- Learning how to take measures
- Learning how to use instruments and components

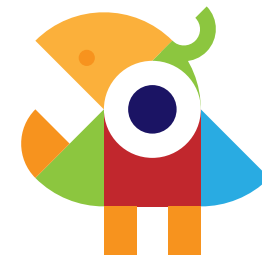
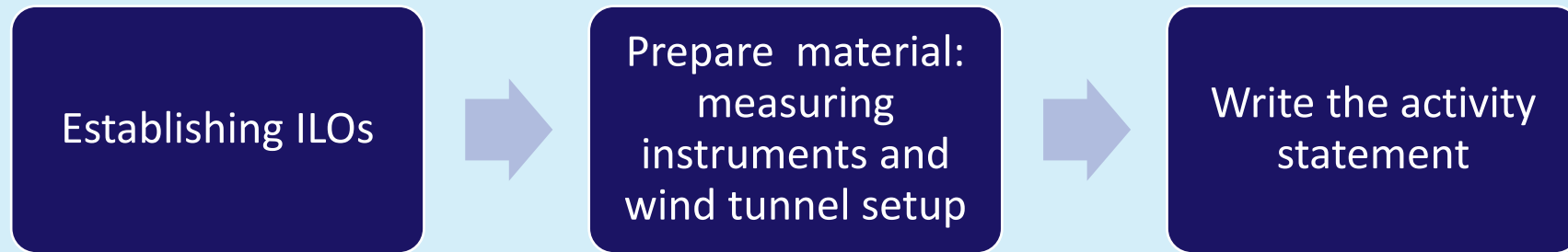


02.

Activity Design



Course scripting



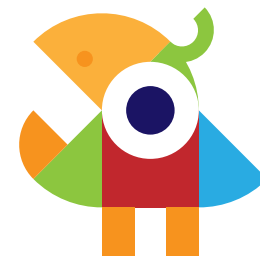
Lesson Flow

Synchronous learning:

1. Description of the work to be done.
2. Description of the data sources.
3. Description of the results expected.
4. Short explanation of the process suggested to develop the task within the time assigned for the activity

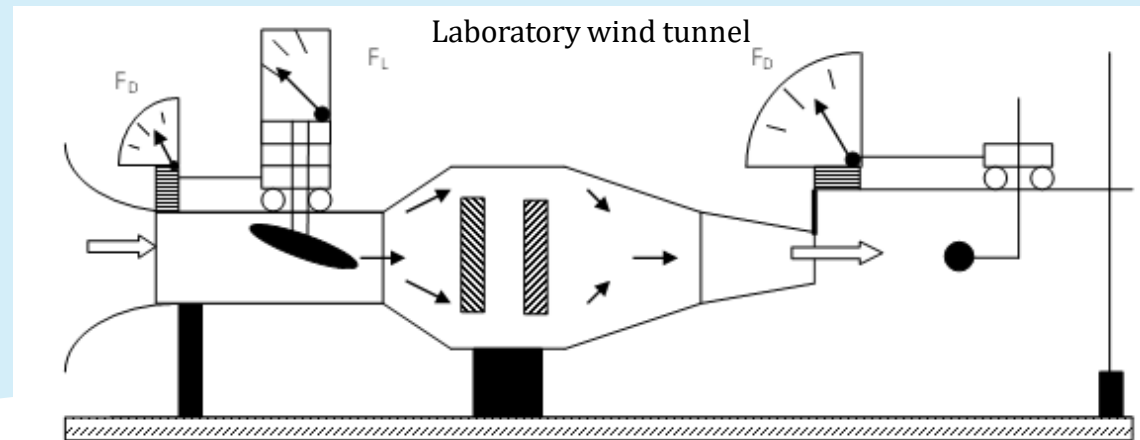
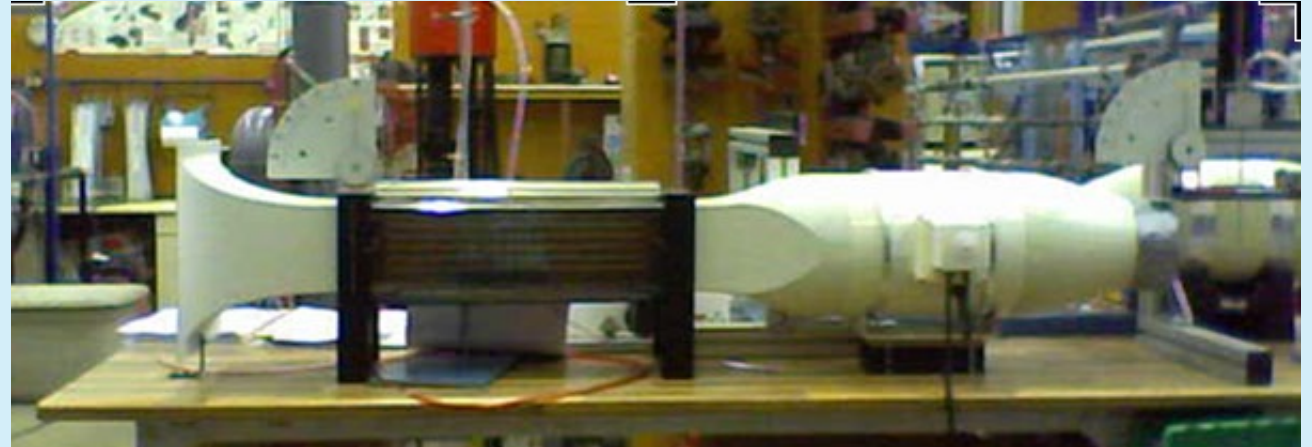
After the lesson (asynchronous learning):

1. The students must prepare a report about the activity,.
2. The students must fill a questionnaire to evaluate the activity.



Materials needed

- Wind inlet
- Straight section with mobile floor
- Motor-driven fan
- Outlet nozzle
- Variable velocity with a potentiometer
- Torsion dynamometer
- Aerodynamic wing profiles



Lesson Flow

How is the measurement of drag and lift forces in the wind tunnel performed?

- Dynamometers are calibrated by choosing a horizontal position in the wing profile;
- Measures are 3 times repeated to assure an average value in every angle of attack
- Drag and lift forces curves are obtained vs the angle of attack.

AIMS OF THE ANALYSIS

- A dataset of drag and lift forces are provided.
- The data refer to experiments performed by different groups of students, in different academic years with different wing profiles.
- Other data obtained from SFLM machine with different drag and lift curves obtained from references for different objects are provided.
- By examining the drag and lift curves obtained for the wing profile selected by the students, they should infer information about the object and test conditions (velocity; angle of attack).



Laboratory measurement procedure

- a) Take measurement of resistance forces with the dynamometer
- b) Take measurement of lift forces with the dynamometer
- c) Disassemble the floor of the wind tunnel
- d) Insert the wing profile in the tunnel
- e) Adjust the position of the wing profile to a horizontal level
- f) Close the wind tunnel
- g) Start the fan
- h) With the potentiometer choose the maximum speed
- i) Wait for the flow to stabilize
- j) Take note of the values of the two forces indicated by the dynamometers
- k) Repeat from point c) varying the position of the wing profile to cover different angles of attack from 0° to 14°



03.

Evaluation and optimization of the learning process



Evaluation and optimization of the learning process

