GRE@T-PIONEER

Project overview and status

ENEN special event 2021 – Outlook of nuclear ETKM activities

March 4th, 2021, online

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BACKGROUND

- **Declining student enrolment** in "nuclear engineering" at European universities, with **specialized courses being phased out**
- **Ageing workforce** in the nuclear industry

➢ **Challenge** to **maintain competence** for the more than 100 reactors in operation in Europe providing 25% of based load electricity

BACKGROUND

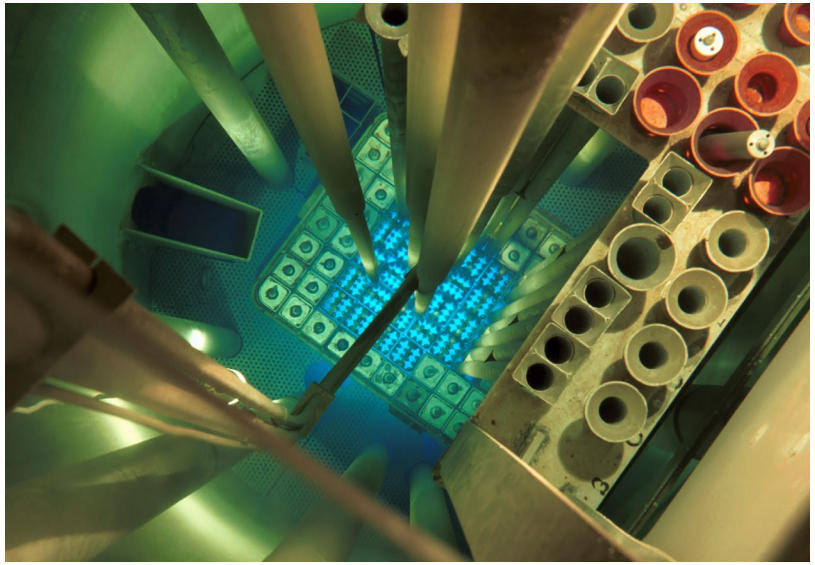
- **GRE@T-PIONEeR**:
  - CSA approved for funding by the EC within the 2019-2020 Euratom work program
  - 3-year project
  - Total budget: 2.6 MEUR, out of which 2.3 MEUR requested from the EC

OVERALL CONCEPT

- Specialized and advanced courses in **reactor physics** and **nuclear safety**, covering both the **experimental** and **computational** aspects

AKR-2
TUD, Dresden, Germany

CROCUS
EPFL, Lausanne, Switzerland



BME Training Reactor
BME, Budapest, Hungary

+ computing environments of the various partners

OVERALL CONCEPT

- Courses offered in a **hybrid** learning environment, combining **on-site** and **off-site** students for **synchronous interactions**

On-site attendance

+

Off-site attendance

OVERALL CONCEPT

- Courses offered in a **hybrid** learning environment, combining **on-site** and **off-site** students for **synchronous interactions**

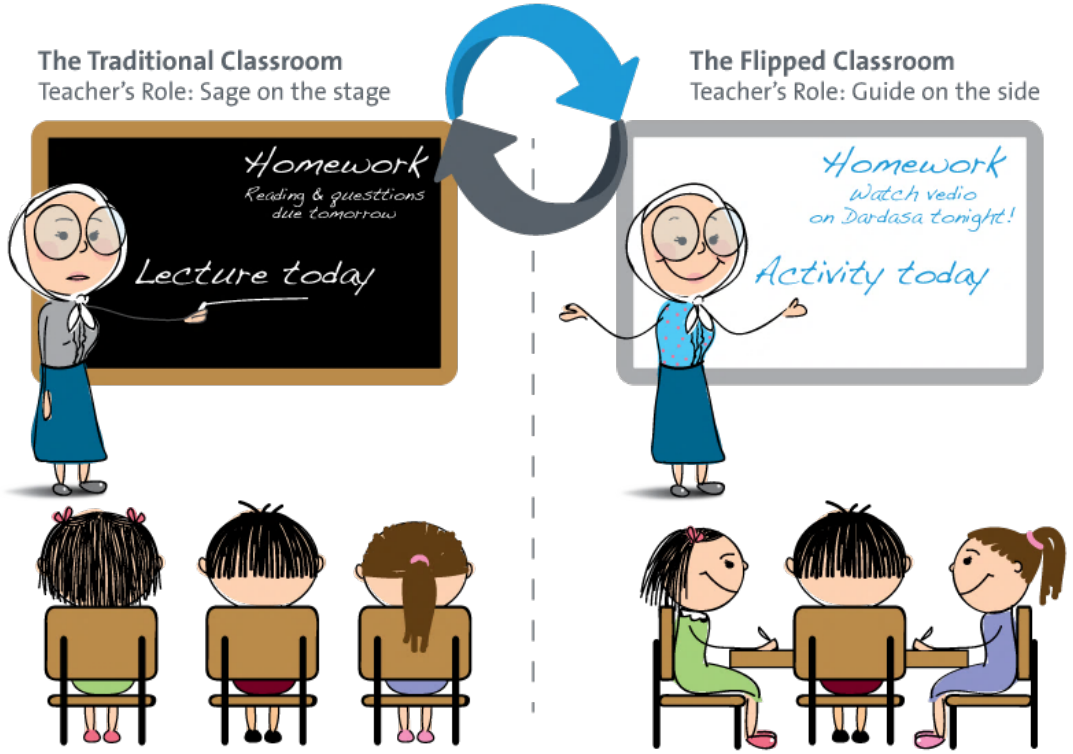
Interactive teaching room
Chalmers, Gothenburg, Sweden

OVERALL CONCEPT

- **Innovative** pedagogical methods:

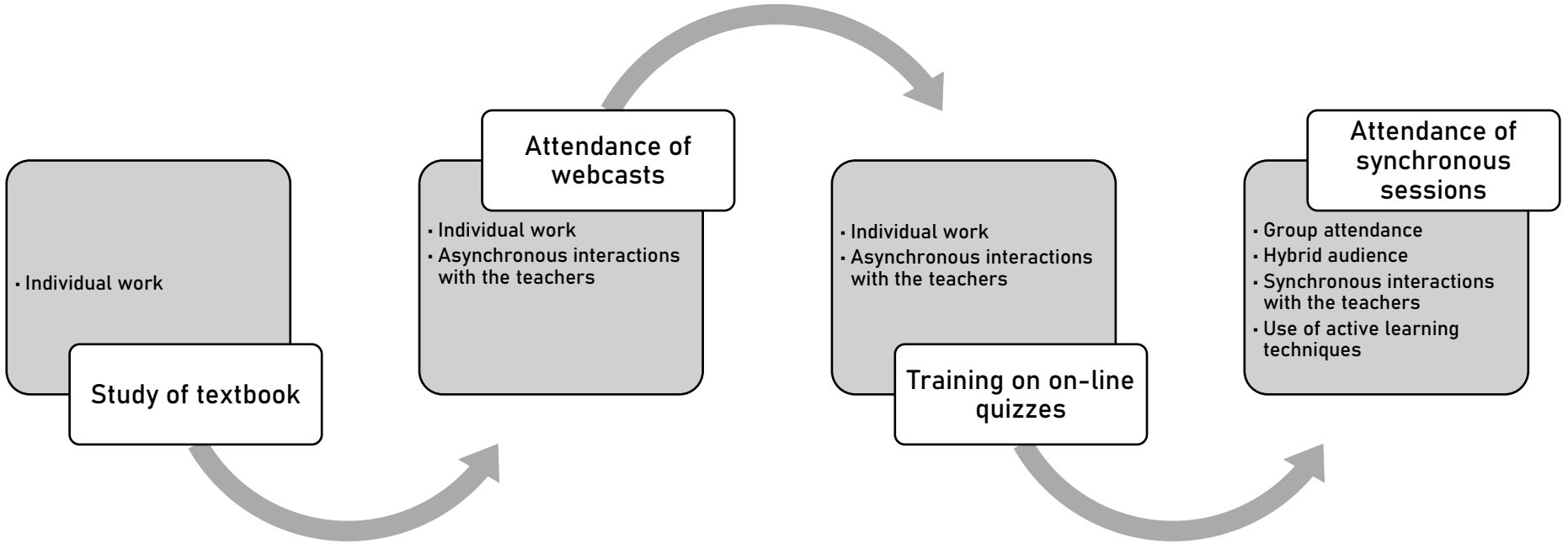
OVERALL CONCEPT

- **Innovative** pedagogical methods:
  flipped classroom + active learning



OVERALL CONCEPT

- **Innovative** pedagogical methods:
  flipped classroom + active learning



Learning sequence using both synchronous and asynchronous interactions

OVERALL CONCEPT

- **Hybrid learning environment** combined with **flipped classroom** and **active learning** already **successfully** tested

Short course on “Deterministic modelling of nuclear systems”, September 9-13, 2019, Chalmers (ESFR-SMART Horizon 2020 project)

11 on-site attendees
16 off-site attendees
(completing the assignments)

Teacher-led coding assignments using MATLAB Grader

CONSORTIUM

- Project partners:
  - **Sweden**: Chalmers University of Technology (**coordinator**)
  - **Germany**: Technical Universities of Dresden and Munich
  - **Switzerland**: Ecole Polytechnique Fédérale de Lausanne
  - **Italy**: Politecnico di Torino
  - **Hungary**: Budapest University of Technology and Economics
  - **Spain**: Universidad Politecnica de Madrid and Valencia
  - **Belgium**: European Nuclear Education Network
  - **France**: LGI Consulting

CONSORTIUM

- Advisory Board:
  - IAEA
  - OECD/NEA
  - GRS
  - Swedish Radiation Safety Authority
  - Hungarian Atomic Energy Authority

CONSORTIUM

- End-Users' Group:
  - Studsvik Scandpower
  - Vattenfall (Ringhals, Forsmark, Vattenfal Nuclear Fuel, KSU)
  - Westinghouse Electric Sweden
  - MVM Paks Nuclear Power Plant Ltd

OBJECTIVES

- Secure the availability of **competence**, **knowledge** and **skills** at the **graduate** level.
- Teach using **new pedagogical methods** (flipped classroom, blended learning, active learning).
- Teach using **distant learning techniques/facilities** as much as possible.

OBJECTIVES

- Fully integrate **hands-on training exercises** in the educational resources, using the research and training infrastructures of the partners.
- Create **a set of coherent courses** where the teachers bring their respective expertise.
- Offer **short period courses** suitable for the industry and to life-long learning.
- Investigate the conditions to make the alliance **sustainable** on the long run.

OBJECTIVES

- Delivery of 10 short courses, each containing:
  - Dedicated handbooks
  - On-line quizzes
  - Pre-recorded lectures (+ teaser videos)
  - Hands-on training sessions (experimental sessions or programming-based sessions)
- Emphasis put on student learning during the entire process

WORKPLAN

- WP1: Mapping of the stakeholder needs versus course offering and teaching methods
- WP2: Development of a course package on nuclear cross-sections for neutron transport
- WP3: Development of a course package on neutron transport at the fuel cell and assembly levels
- WP4: Development of a course package on core modelling for core design

WORKPLAN

- WP5: Development of a course package on core modelling for transients
- WP6: Development of a course package on reactor transients, nuclear safety and uncertainty and sensitivity analysis
- WP7: Development of a course package on radiation protection in nuclear environment
- WP8: Promotion, dissemination and courses teaching
- WP9: Project management

WORKPLAN

- WP2-WP6 structured along the procedures to follow to make core calculations:
  - Cross-section preparation (WP2+WP3)
  - Core calculations for core design (WP4)
  - Core calculations for reactor transients and nuclear safety (WP5+WP6)

➢Possibility to attend given modules based on personal interest, depending on background knowledge and required expertise

PROJECT STATUS

- Project started on Nov. 1st , 2020
- Work performed so far:
  - WP1:
    - Competence mapping **completed**, using the European Qualifications Network (on-going analysis of the results)
    - Inventory of available e-learning platforms and distant leaning facilities at the disposal of the consortium **completed**
    - On-going inventory of existing training offers on the market
  - WP2-7:
    - Preparatory work on establishing the detailed contents of the handbooks
    - Work on the preparation of the handbooks has already started

PROJECT STATUS

- WP8:
  - Project website launched: http://great-pioneer.eu/

PROJECT STATUS

- WP8:
  - Visual identity of the project established
  - Social media accounts created:
    - Twitter: @GREATPIONEeR_EU
    - LinkedIn: @GREAT-PIONEER
  - Active in conferences and events on nuclear education and training: Prelude to NESTet21, ANS CONTE 2021, NESTet21, etc.
- WP9:
  - Internal communication platform launched, with all associated quality assurance procedures
  - Project management

CONCLUSIONS

- **Innovative pedagogical methods** at the core of the project.
- **Active learning** heavily relying on **programming-based**, **computer-based** and **research reactor-based hands-on training exercises**.
- Teachers working **together** to develop a set of **coherent** and **complementary** courses.
- **Condensed** course modules organized along a "**story to tell**".
- **Collaborative workshop** planned in the fall of 2021 on teaching methods in the nuclear sector.

Thank you!

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