USING ACTIVE LEARNING IN HYBRID LEARNING ENVIRONMENTS

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TASK FORCE ON DETERMINISTIC REACTOR MODELLING
BACKGROUND

• Declining student enrolment in nuclear engineering programs in Europe

➢ Challenge:
  ▪ for knowledge preservation
  ▪ for maintaining highly specialized courses alive
BACKGROUND

• Efforts initiated at the Physics Department to teach in “hybrid” learning environments:

On-site attendance + Off-site attendance
BACKGROUND

• Special interactive teaching room developed:
BACKGROUND

• Focus on favouring student learning:
  • Flipped classroom pedagogy
  • In-class active learning
BACKGROUND

• Challenging to design active learning sessions in hybrid learning environments

• Examples of two short courses (one week each) given within two European projects (CORTEX and ESFR-SMART)

• Focus on student engagement
METHODS AND RESULTS

• Pedagogical approach used for both courses:
  - Study of the textbook
  - Attendance of the webcasts
    • Individual work
    • Asynchronous interactions with the teachers
  - Training on on-line quizzes
    • Individual work
    • Asynchronous interactions with the teachers
  - Attendance of the synchronous sessions
    • Group attendance
    • Synchronous interactions with the teachers
    • Use of active learning techniques
METHODS AND RESULTS

• Contents of the synchronous sessions:
  CORTEX course
  Short summarizing lectures
  Discussions on quizzes
  Teacher-led exercises
METHODS AND RESULTS

• Contents of the synchronous sessions:

  CORTEX course
  Short summarizing lectures
  Discussions on quizzes
  Teacher-led exercises

  ESFR-SMART course
  Short summarizing lectures
  Teacher-led coding assignments
  using MATLAB Grader
METHODS AND RESULTS

• Attendance:

  CORTEX course  
  14 on-site attendees  
  10 off-site attendees  
  (completing the assignments) 

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

• End-of-course evaluation questionnaires:

  CORTEX course  
  23 respondents  
  (52.2% on-site respondents) 

  ESFR-SMART course  
  25 respondents  
  (40% on-site respondents)
METHODS AND RESULTS

➢ Students’ overall impression of the courses:
  CORTEX course
  ESFR-SMART course

- Not good at all.
- Somewhat not good.
- Good.
- Very good.

87% 13% 80% 20%
METHODS AND RESULTS

- Students’ opinion about the best teaching format for learning the course concepts:

**CORTEX course**

- Much better in the traditional set-up: 47.8%
- Somewhat better in the traditional set-up: 26.1%
- Equally well in the traditional and flipped set-ups: 8.7%
- Somewhat better in the flipped set-up: 17.4%
- Much better in the flipped set-up: 8%

**ESFR-SMART course**

- Much better in the traditional set-up: 32%
- Somewhat better in the traditional set-up: 36%
- Equally well in the traditional and flipped set-ups: 8%
- Somewhat better in the flipped set-up: 20%
- Much better in the flipped set-up: 8%
METHODS AND RESULTS

- Students’ opinion about the quality of the pedagogical approach:
  - CORTEX course
  - ESFR-SMART course
METHODS AND RESULTS

- Students’ opinion about the contribution from the on-line quizzes to learning:

  CORTEX course

  - 91.3% Positive contribution
  - 8.7% Negative contribution

  ESFR-SMART course

  - 84% Positive contribution
  - 8% No opinion
  - 8% Negative contribution
METHODS AND RESULTS

➤ Students’ opinion about the level of engagement of the synchronous sessions:

**CORTEX course**
- 52.2% Not engaging at all
- 47.8% Somewhat engaging
(54% of off-site attendees finding the sessions somewhat engaging)

**ESFR-SMART course**
- 76% Not engaging at all
- 8% Somewhat engaging
- 16% Very engaging
(33% of off-site attendees finding the sessions somewhat/not at all engaging – help from a Teaching Assistant to handle queries from remote attendees)
METHODS AND RESULTS

Teacher’s impressions:

- Deeply engaged students
- Rewarding for the teacher to support the students when they most need help
- Active learning-based assignments triggered questions not necessarily related to the assignments
- Interactions with the students/teacher occurring at a much higher level of conceptual understanding
DISCUSSION AND CONCLUSIONS

• Hybrid learning environment combined with flipped classroom setup and active learning techniques resulted in deep student engagement

• Flexibility of the format:
  • Some resources available 24/7 for self-paced learning
  • No need to travel on site
DISCUSSION AND CONCLUSIONS

• Careful preparation and planning needed
• Use of many IT resources
  ➢ Dedication from the teaching staff necessary
ACKNOWLEDGEMENTS

Financial support from the European Commission via:

• The CORTEX project

  (Euratom research and training programme 2014-2018 under grant agreement No 754316)

• The ESFR-SMART project

  (Euratom research and training programme 2014-2018 under grant agreement No 754501)