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Evolving professional development in nuclear reactor physics and safety through hybrid learning environments

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Outline

- Context
- Research design
- Initial results

Context

- Impact of knowledge dynamics on professional work and learning
  - Particularly pronounced in modern engineering
    - Engineers tasked with designing innovative solutions
    - Incorporation of cutting-edge technology necessitates a deep understanding of the latest advancements

Context

- Nuclear engineering
  - Affordable computing power has augmented significance of modelling and simulations
  - Crisis in European nuclear engineering programs
    - Alarming decline in student enrolment
    - Increasing demand for skilled labor
    - Courses typically follow a traditional, lecture-based design, which presents obstacles to participation and learning

Context

- Nuclear engineering
  - Potential solution: collaborative online learning programs with greater accessibility and flexibility
  - Challenges of online learning: low student engagement and high drop-out rates
  - Hybrid approaches as a solution
    - Addressing the limitations of online and traditional courses
    - Capitalizing on their inherent strengths

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- Preserving competencies and skills in computational and experimental nuclear reactor physics and nuclear safety
- Ten partners from six European countries
- Six advanced courses offered globally
- Courses cater to MSc and PhD students, Post-Docs, and nuclear professionals

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- Online and hybrid versions
- Flipped classroom & principles of active learning
- Preparatory asynchronous (online) sessions
  - Handbooks, short video lectures, online quizzes
- Synchronous sessions (in-class or online)
  - Combination of individual and collaborative active learning activities

Research design

- To investigate the effects of a digitalized learning environment on learners and their learning

Research questions

1. How do flipped and online flipped classroom affect student learning experiences?
2. What are the contributing factors influencing student performance, engagement, and satisfaction, particularly through the lens of four learning theories?

Research design

- To investigate the effects of a digitalized learning environment on learners and their learning
- Data Collection
  - Data on motivation and learner background
  - Learning analytics data from the Moodle-based learning management system
  - Survey instrument

Research design

- Survey instrument rooted in four learning theories
  - Community of Inquiry framework
  - Transactional Distance theory
  - Self-regulated Learning theory
  - ARCS Model of Motivation
- Validated standard instruments + course satisfaction
- Distributed after each course module
  - ≈ 50 learners participated in each module
  - 50% of participants responded to the survey

Initial results

- Learner performance
  - Pure online participants displayed strategic behavior, often just meeting the minimum requirements
  - Onsite learners frequently achieved maximum points

Initial results

- Learner engagement
  - Overall completion of learning activities was high
  - Online learners showed a significantly lower completion rate, especially during synchronous sessions
- Learner satisfaction
  - Participants (both online and hybrid) expressed exceptionally high levels of satisfaction with the course

Thank you!

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