Digital competency developing activities in Engineering Education and curriculum alignment.

Author Name(s) [from Institution #1]
Mads Ronald Dahl
CED, Aarhus University, Denmark, wiz@au.dk

ABSTRACT
Keywords – Digital competency, curriculum development, curriculum analysis and alignment

Please indicate clearly the type of contribution you are submitting: __x_ hands-on, ___explore, ___poster.

Background

Digital competences are essential for the field of engineering and at all levels of employment. As the technological development and digitalisation in modern society have influenced the working world of engineering, there could be a recognised need for new competences and generic terminology.
When the literature and media states that the digital transformation and technology will play a key role in enabling a more sustainable future it falls back on engineering to utilize the development and opportunities. The engineer of the 21st century is very much in a different position and must be educated accordingly (Tryggvason et al. 2006).

There is no shortage of technical areas and digital subjects to be explored: Artificial Intelligence, Internet of Things (IoT), Mobile Computing, Robotics Augmented/Virtual Reality, Big Data Analytics, Blockchain, Programming, Cloud Computing, Human Machine Interface, Intelligent Manufacturing, Intelligent Sensors, Internet of Services (IoS), and Three-Dimensional Printing + more. But all these areas and topics will again change over time and develop into new topics and other areas. Thus, we can't define digital competencies in a generic way by describing the different applications or examples of usage. Furthermore, it would be a fragile terminology for digital competences that was based on one or few subject specific topics. The work of engineers most often takes place in complex networks with many different professionals and collaborators. So, there must be some overlap in digital competences between professions, topics and subjects. The digital skill sets of today's engineers will go through a continuous transformation with respect to the requirements of the digital age. The mindset and foundation of relevant digital knowledge, skills and attitudes must be integrated in engineering education as relevant lifelong learning of each individual engineer. The task of curricula alignment with digital competency development is important and can be compared to train engineering students' interdisciplinary skills (Van den Beemt et al. 2020).
The European Digital Competence Framework (Vuorikari et al, 2022) gives a generic and structured terminology for describing digital competencies for citizens that can be fruitful as a base reference for development of more specific and subject oriented language for digital competencies in engineering. The Framework DiKoLAN (Digital Competencies for Teaching in Science Education, Kotzebue et al. 2021) addresses the challenge of implementing subject specific technology related professional digital competencies in science education and teaching. Using these two frameworks to analyse and develop curricula can give an orientation aid for better alignment and integration of digital competencies in education.
This workshop will give the participants an opportunity to try our dialog tools and activities for adoption of the terminologies introduced in the frameworks, identify relevant activities, and develop their own narrative for subject specific digital competencies in engineering.

The workshop agenda:

Introduction:

- Short introduction of the workshop, participants and making groups
- Introduction to DigComp 2.2 terminology (10 mins)
- Introduction to activity 1.1

Hands-on Activity

Activity 1.1: mapping of digital competencies of engineering using DigComp 2.2 and DiKoLan (20 min, upload picture of board to padlet)

Introduction to activity 1.2

Activity 1.2: Elaborate on selected area of digital competency development in activity 1.1 (10 min, upload picture of board to padlet)

Introduction to activity 1.3

Activity 1.3: Exploring the context of a central digital competence in engineering education and give examples of both course level and curriculum level alignment
(30 min, upload picture of board to padlet)

Evaluation

Discussion & Evaluation & Conclusions (20 mins)
Total 90 mins

REFERENCES

Tryggvason, Gretar, and Diran Apelian. "Re-engineering engineering education for the challenges of the 21st century." JOM 58.10 (2006): 14-17.

Van den Beemt, Antoine, et al. "Interdisciplinary engineering education: A review of vision, teaching, and support." Journal of engineering education 109.3 (2020): 508-555.

Vuorikari Rina, Riina, Stefano Kluzer, and Yves Punie. DigComp 2.2: The Digital Competence Framework for Citizens-With new examples of knowledge, skills and attitudes. No. JRC128415. Joint Research Centre (Seville site), 2022.

Kotzebue, Lena von, et al. "The framework DiKoLAN (Digital competencies for teaching in science education) as basis for the self-assessment tool DiKoLAN-Grid." Education Sciences 11.12 (2021): 775.