Global co-creation of learning resources towards improved quality: Possibility or Utopia?

Torsten Fransson
Prof em, KTH
fransson.kth@outlook.com

Three words of warning!

- ***All about energy (mainly mechanical)***
- ***Mainly MSc***

- **Nothing about ChatGBT**

Will we need any educator-to-educator collaboration at all?

Outline

General thoughts

Teaching vs Learning

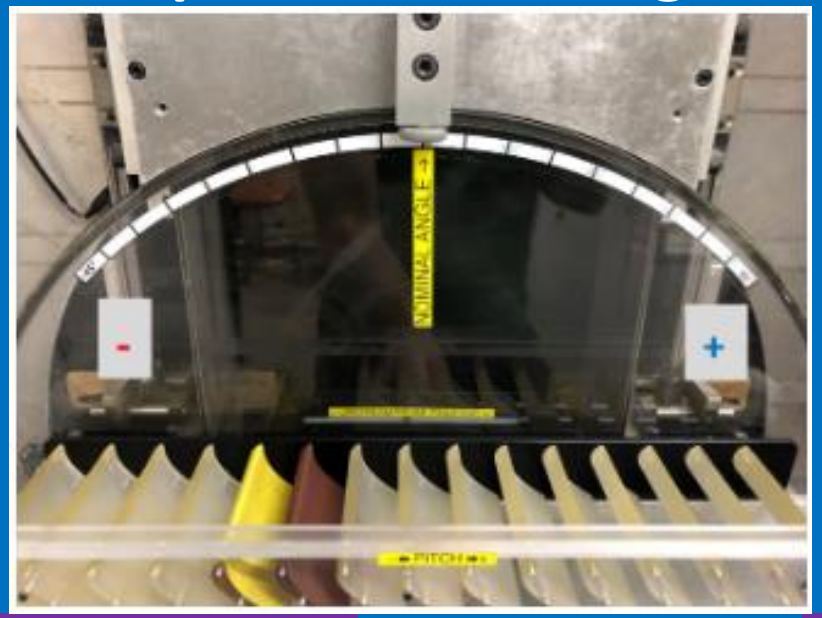
Is MOOC “the solution”?

Is “remote” gaining speed?

Collaborate on education: Suggestion

Thoughts about collaboration: Research

- As researchers we collaborate internationally with our peers in different ways
  - ✓Of course: High competition on our home turf!
- Collaboration is recognized as giving higher quality
- Peer review is essential for publication
- Collaboration increases chances for citations and thus personal ranking
  - ✓Promotion depends upon it?
- University rankings depend upon larger groups



Thoughts about collaboration: Education

- Do educators collaborate internationally with our peers in different ways?
  - ✓ *No competition at all on our home turf?*
- Is collaboration recognized as giving higher quality?
- How do we perform peer review?
- Collaboration ***should*** increase chances for citations and thus personal ranking
  - ✓ *Does promotion depend upon it?*
- Does university ranking depend on education?

Polling (show of hands)

- Have you had your journal/conference articles peer reviewed during the last 3 years?
- Have you yourself reviewed such articles during the 3 last years?
- Has your educational material (down to “lecture level”) been peer reviewed during the 3 last years?
- Have you yourself peer reviewed educational material from someone else the last 3 years?

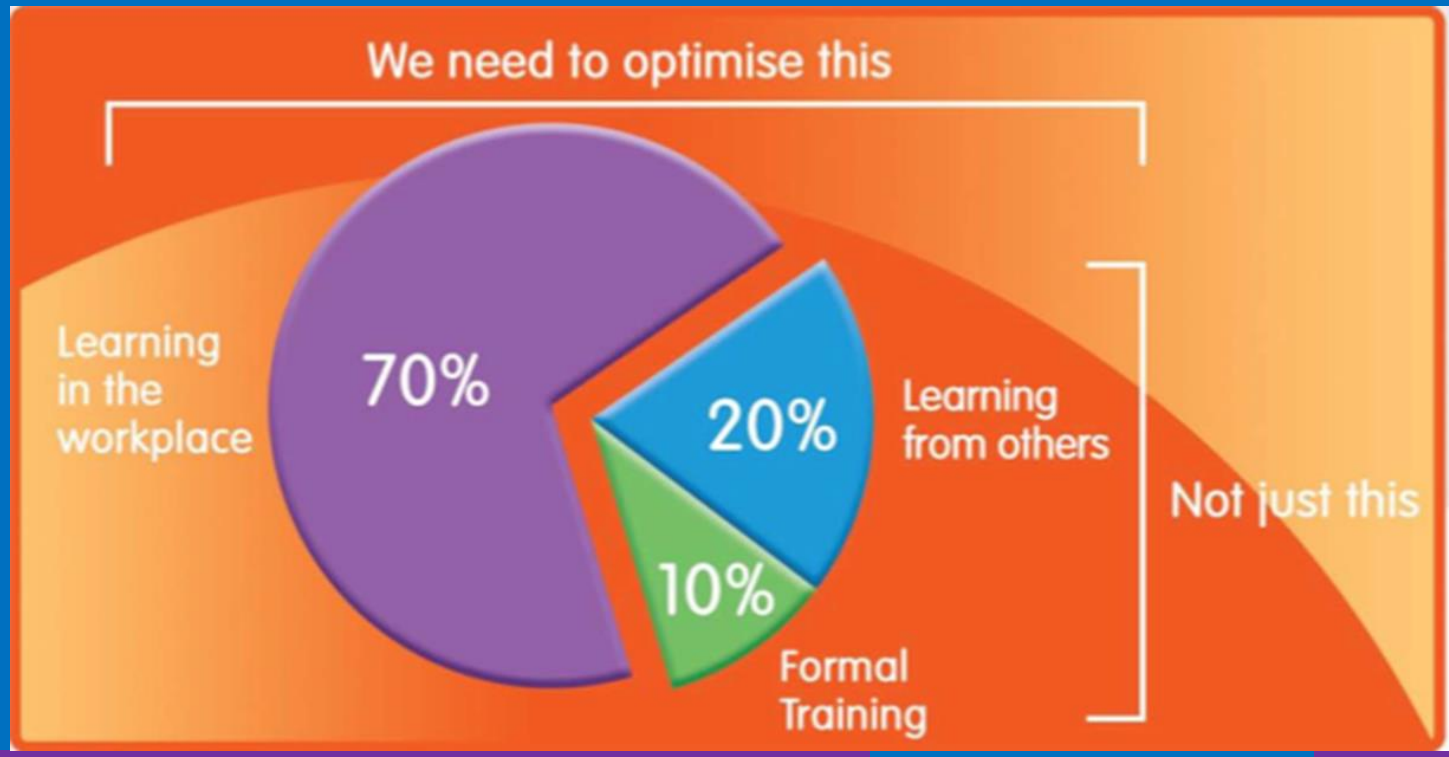
Education: Teaching vs Learning

- Teachers teach
- Learners learn
- How much “teaching” do we need today?
- What exactly is “teaching”?
- Is it not more guidance and mentoring that is needed today??

Remote Education: Teaching vs Learning

- **Remote learning in the sense of ”off-campus” has always taken place**
- **It seems tough to have a ”less value” than on-campus**
- **Why is this, and can remote become equal?**

If the “Learning in the workplace” is 70% why do we as teachers then put all our resources on the 10%?



Post-Covid19 Education

Before Covid19: Remote was a "no-no":

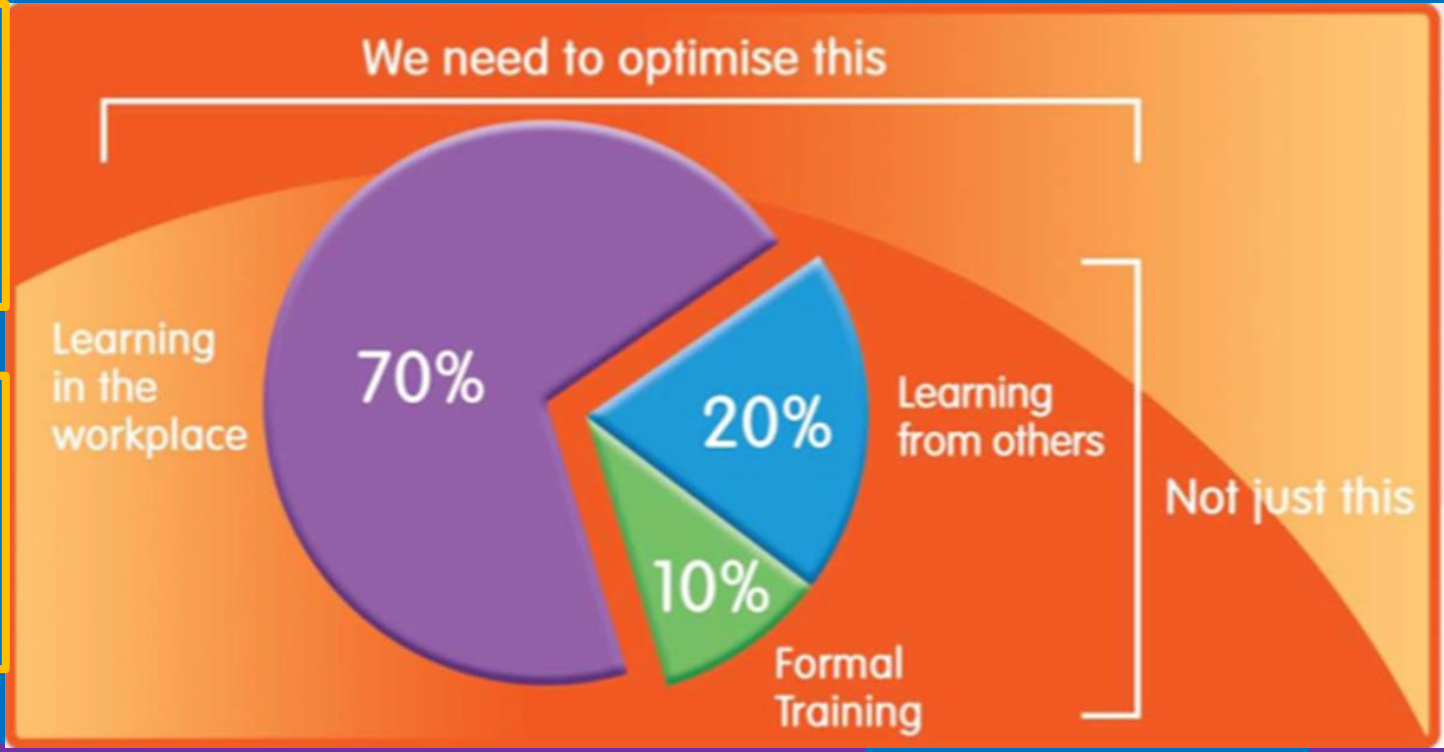
- ✓ Labs: "Will never give equal value"
- ✓ Teaching: "I must see my students in the eyes"

After Covid19:

- ✓ Labs: Can help a lot
- ✓ Teaching: Zoom, Teams, …..

But do we do "remote" correctly?

- ✓ Is not focus too much on teaching?
- ✓ Is a "Zoom lecture" good enough?



Let us go back 935 years, to 1088 in Bologna:
Reading in the library

The Smithsonian Book of Books;
Michael Olmert, 1992

And going to class

Do we still need this?

Picture: various sources

rch 11, 2024

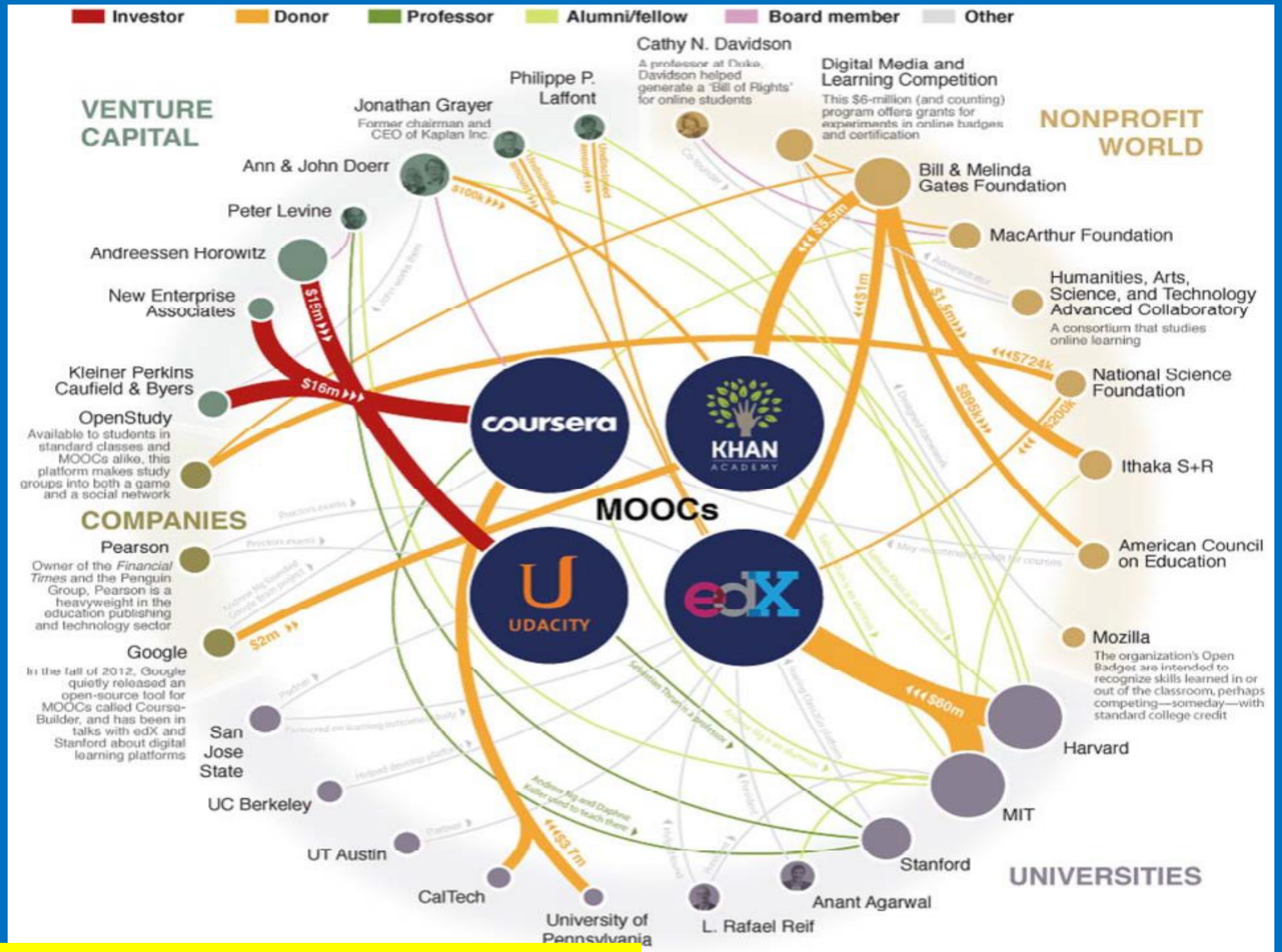
Focus on learning, not teaching

- Self-paced
- Any where
- Any time
- Just in time
- Collect knowledge (and points as assesments)
- ILO & ALO
- How to get creativity into “not physical meetings”?
- How to create remote collaboration?

Education is a *BIG* market!

Will BigTech enter the market?
With AI?

Major Players in the MOOC Universe



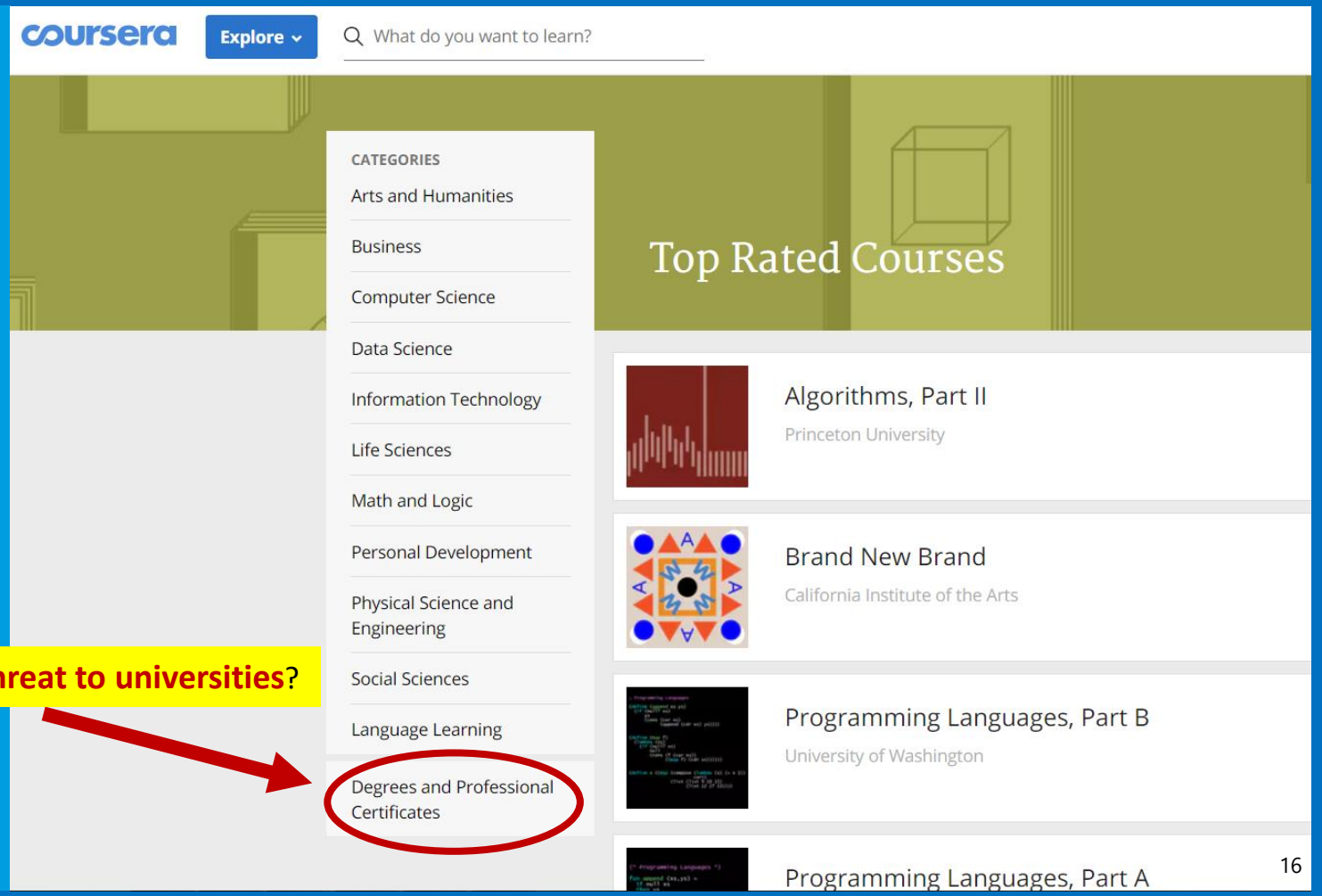
Source: The Chronicle of Higher Education

Is a MOOC-platform the solution for the future? (Ex: Coursera)

- MOOC=Massive Open Online Course

- Offered by:
  - Coursera
  - EdX
  - UdaCity
  - Kahn Academy
  - Futurele
  - Diversity
  - …

Is this a threat to universities?



16

Is Common Micro-Credentials Framework the solution? (FutureLearn)

Search online courses

Sign in

Microcredentials and programs

Microcredentials and programs allow you to pursue further study in a specialised field. Microcredentials are accredited qualifications created by leading universities for you to build professional skills relevant to your career. Programs allow you to deepen your understanding of a subject, with the opportunity to earn a professional or academic creden

Common Micro-Credentials Framework:

- **EQF 6-7**
- **100-150 Learning Hours**

Microcredentials 3 MICROCREDENTIALS

Our online microcredentials are designed to upskill you for work in rapidly-growing industries, without the time and cost commitment of a full degree. You can earn academic credit to use towards a degree or they can be used as an independent certification. Each microcredential includes a formal online assessment and meets the standards set by the Common Microcredential Framework (CMF).

The Open University endorsed by Cisco Networking Academy

Cyber Security Operations

The Open University

Global Development in Practice: Designing an Intervention

The Open University

Teacher Training: Embedding Mental Health in the Curriculum

What might be the next step?

Although these allow for some individual choices, all seems to be fairly traditional?

- Only distribution mechanism changes?
- One organization delivers “everything”?
- How is the cost set?
  - ✓ ~650€ for 10 UK credits => ~15’000 € for a 2 year (120 ECTS) MSc.
  - ✓ How much compared to an on-campus program?
- Is this affordable in emerging economies?
- What about collaboration for better educational experiences?
- How are ”local conditions” taken into consideration?

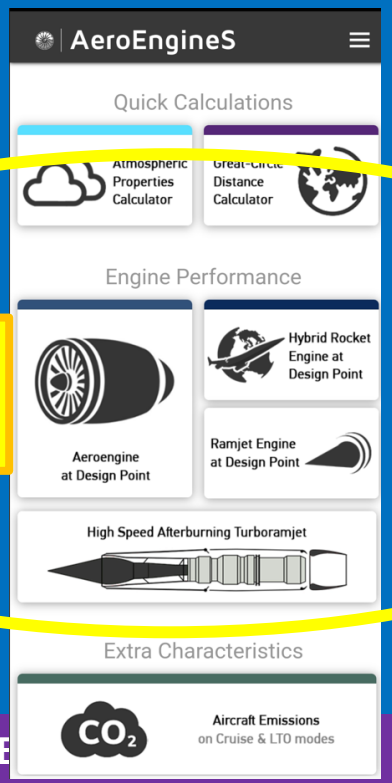
➢**What might be the next step?**

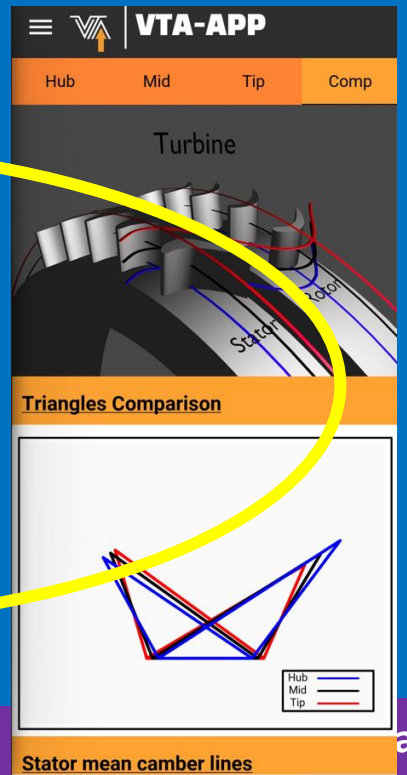
Libraries of videos, simulations and labs *(much less in non-electricity than in electricity)*

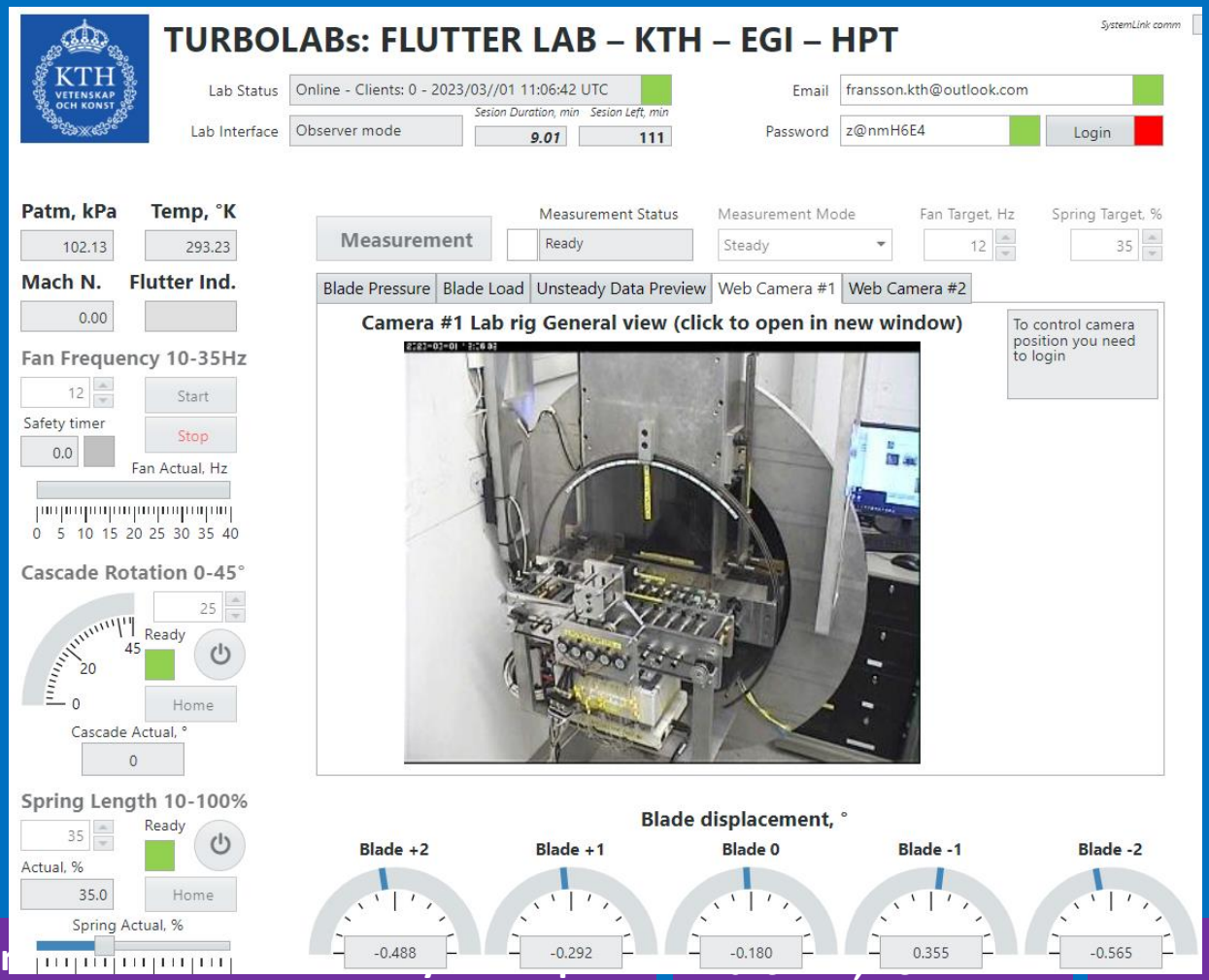
- **Most universities probably have a library of remote labs (*since Covid19*), videos etc**
  - ✓ **Often directed towards their own students**
  - ✓ **Often difficult to run for the ”non-specialist”**

- **Some open:**
  - **Example Carnegie Mellon (Chemistry)**

- **Aristotle University**







Picture: KTH/E ation

Two more examples of labs

West Attica university:

Users from 63 countries

Labsland

LABS, EQUIPMENT AND SERVICES

1. Access to Laboratories

1- Digital electronics
- FPGA
- Intel DE2-115
- Intel DE1-SoC
- Digital Trainer
- Boole Designer
- STM32 Nucleo

2- Robotics & Tech
- Arduino Robot
- Basic Arduino
- 3D Printer

3- General electronics
- Electronics
- AC Electronics
- Common circuits

4- Physics
- Kinematics
- Radioactivity
- Archimedes
- Pendulum
- Spring
- Advanced buoyancy
- Optics
- Boyle's Law
- Electronics
- AC Electronics
- Snell's Law
- Conservation of Momentum
- Free Fall

5- Engineering & Instrumentation
- Luxometer
- Sonometer
- Thermographic Camera
- Centrifugal Pump
- Pelton Turbine
- Texture Analyser
- Flowloop

6- Chemistry
- Gay-Lussac's Law
- Boyle's Law
- Acid-Base titration (v1)
- Acid-Base titration (v2)
- Diffusion
- Exchangeable Acidity of Soils
- Water Heating and Cooling Curves

7- Biology
- Planarians

2. Remote Laboratory Hardware

- Arduino Robot
- Arduino Board
- Intel DE1-SoC
- Intel DE2-115
- ST Nucleo WB55RG
- TIVA Launchpad with tm4c129
- Analog Electronics lab

3. Additional Services

- Creation of real-time labs
- Creation of ultraconcurrent labs

Shift Gear
Let us consider *collaboration* in education

- Teachers **share** basic educational material
- Teachers **re-use** basic educational material (????? NIH-syndrome?????)
- Teachers **collaborate** to improve basic educational material and to create **common courses**
- Teachers **collaborate** towards establishing (common or not) not-for-profit **degree-awarding programs** (academic, professional).

- *Students* **prepare themselves** *before class.*
- *Students* **establish themselves** *their "missions" and personal learning journeys*

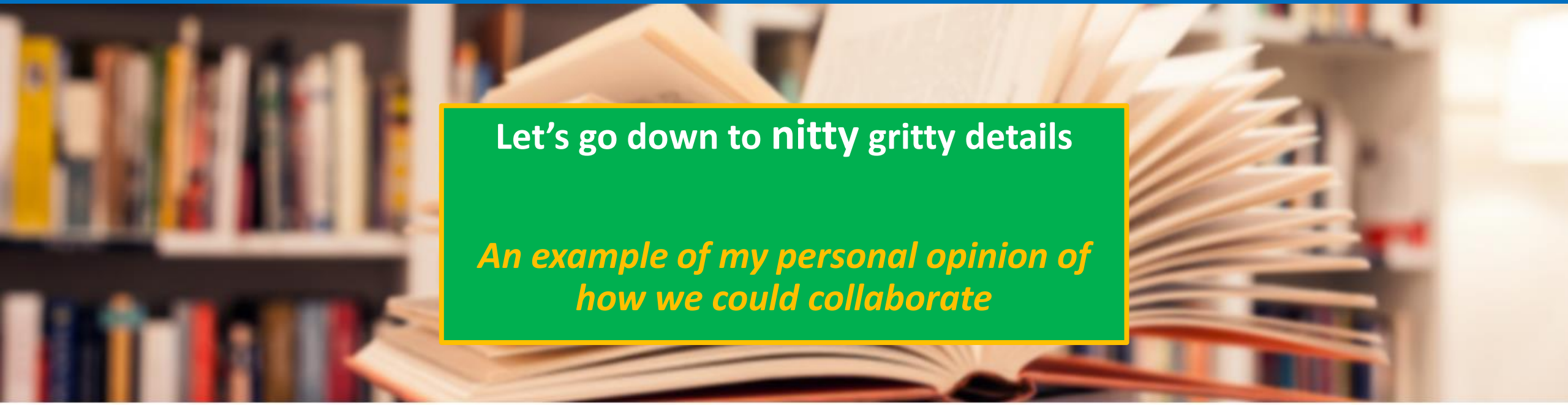
Can this be imagined?

✓ **If so, what about quality and peer reviews?**

Words from colleagues about “collaboration in eduction”

- Global interaction, networking, multicultural
- Platform to share and better one’s academic standing
- Development of high-quality learning materials out of the collaboration
- Shared experiences results in better approaches and presentations
- Quality Improvement Process promotes continuous improvement towards high quality learning materials
- Developed materials for student-centred pedagogicy can be very useful complementary learning materials during online learning
- Certification at multiple levels can be a source of continuous motivation for the learner.
- Collaborative
- Innovative in the area of online + active learning
- Promoting UN Sustainable Development Goals

Educator to Educator Collaboration?



Let's go down to nitty gritty details

An example of my personal opinion of how we could collaborate

EXPLORE ENERGY

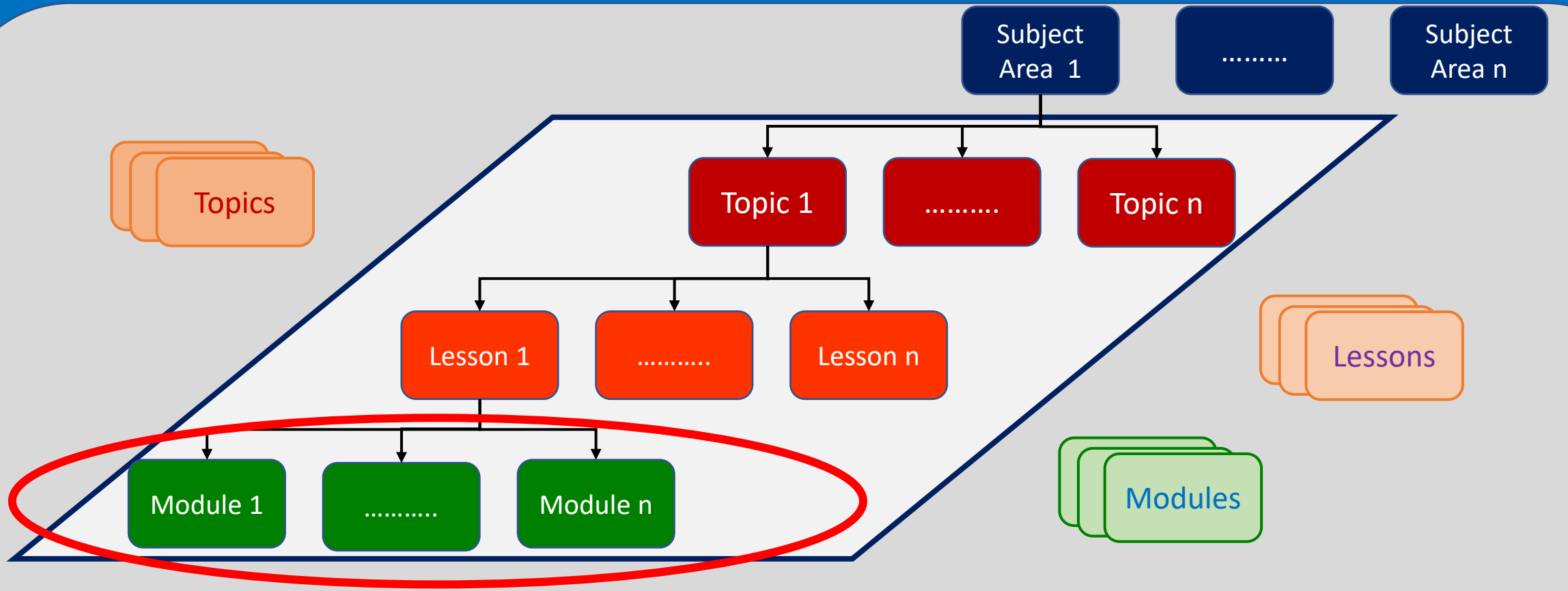
The Energy Educators Global Knowledge-network

– EXPLORE Energy Digital Academy –

Structure of Learning Content:

Material comes from different sources globally:

- Some teachers (or group of teachers) provide educational material in a complete “Subject area”
- Some teachers provide material in a complete “Topic”
- Some teachers provide material only in a complete “Lesson”
- And some teachers provide material corresponding to only individual modules

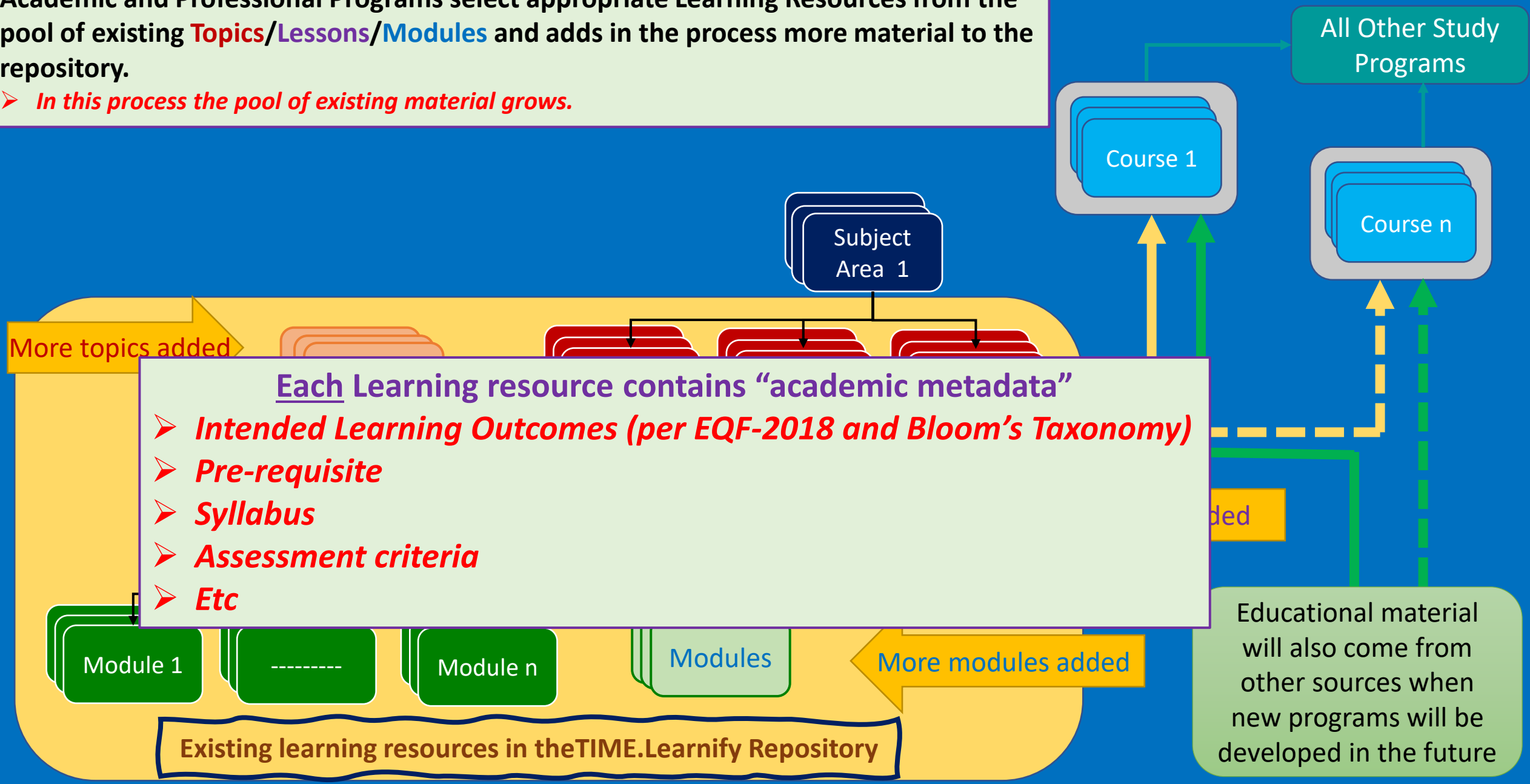


Every content in the repository is called a “Learning Resource”:

- Independent upon if it is a “Subject area”, a “Topic”, a “Lesson” or a “Module”

Academic and Professional Programs select appropriate Learning Resources from the pool of existing Topics/Lessons/Modules and adds in the process more material to the repository.

- ***In this process the pool of existing material grows.***

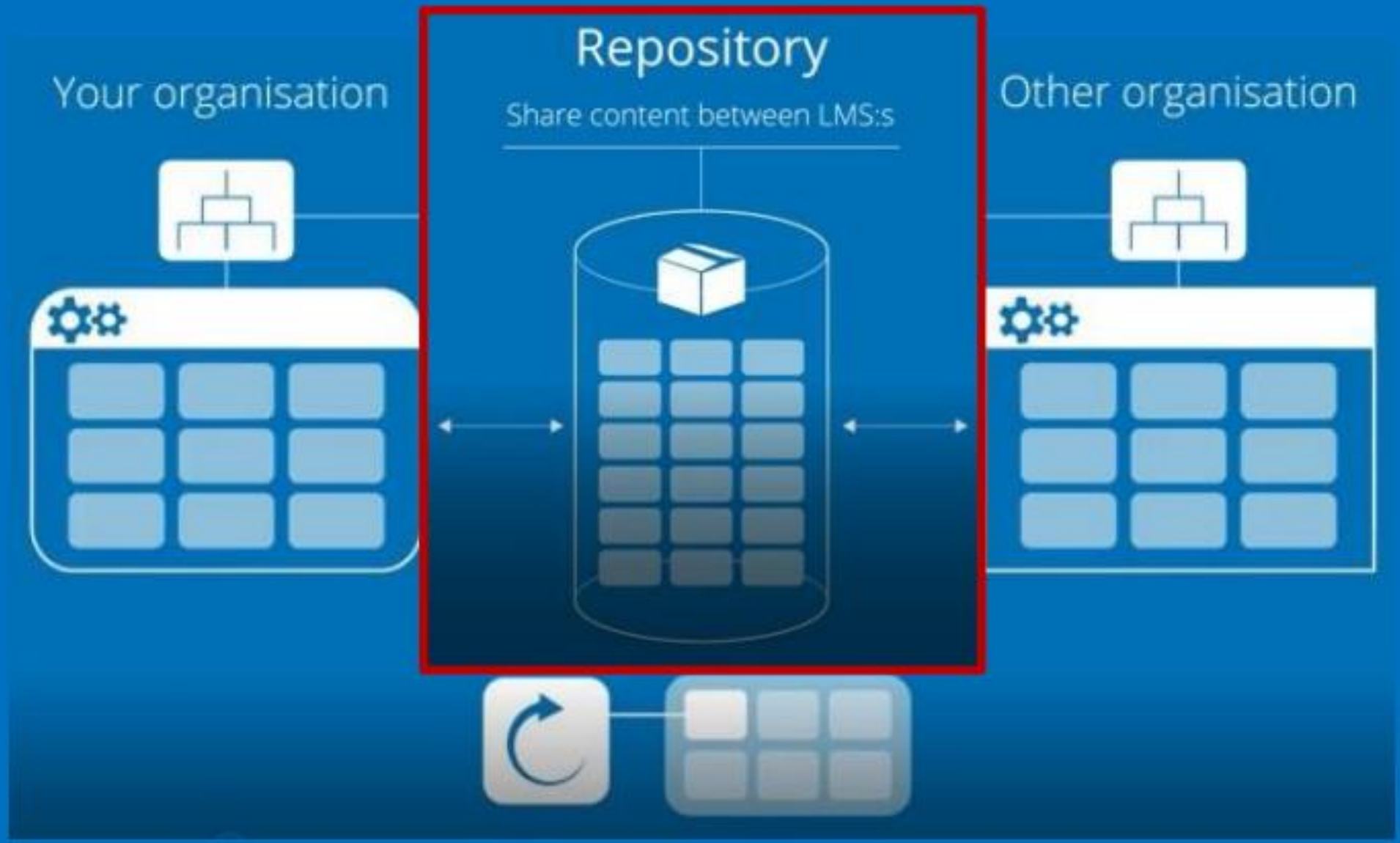


Example of small Learning Resources (=Modules [Max 5 ELH] each)

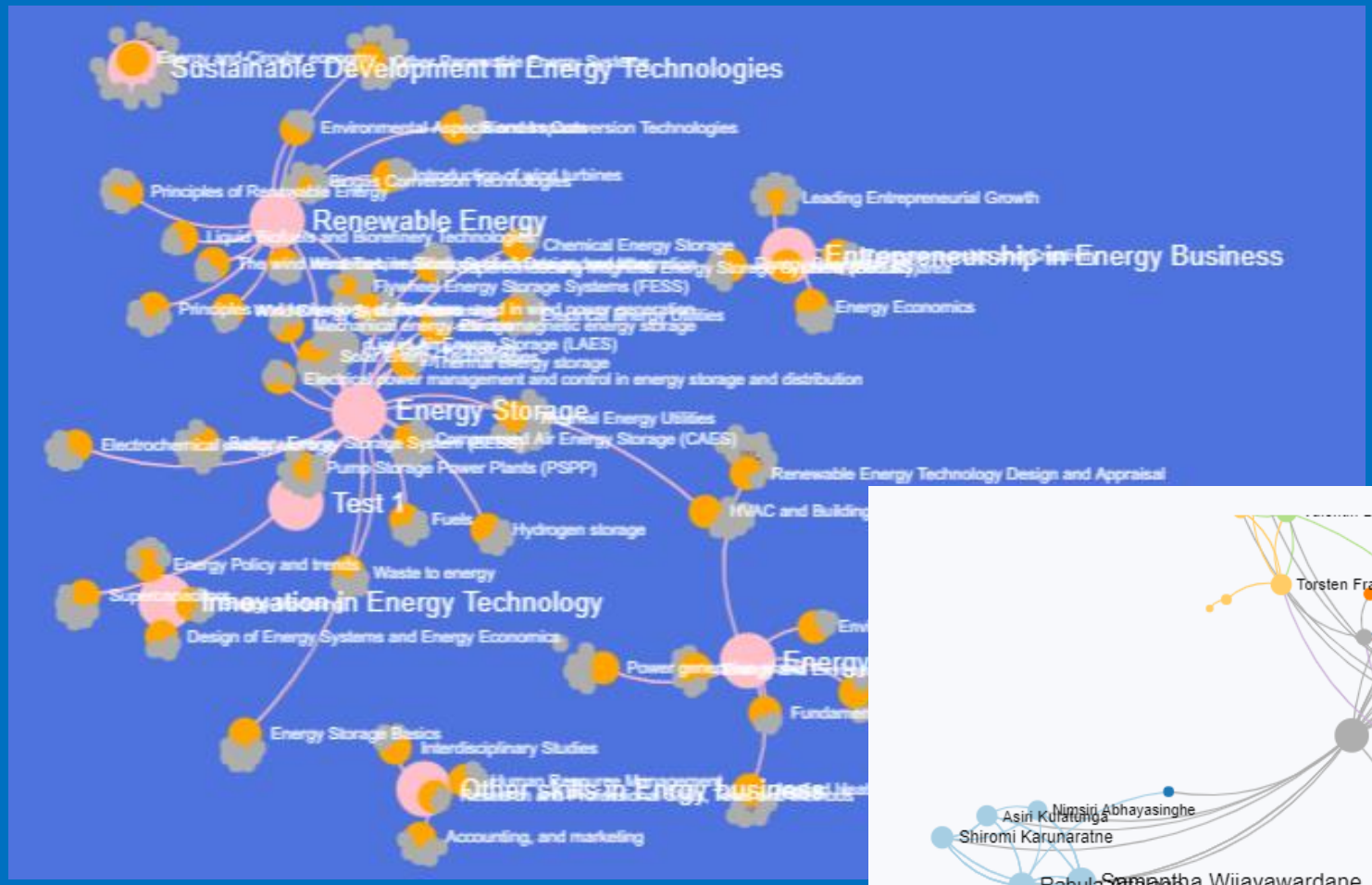
Present use of the concept

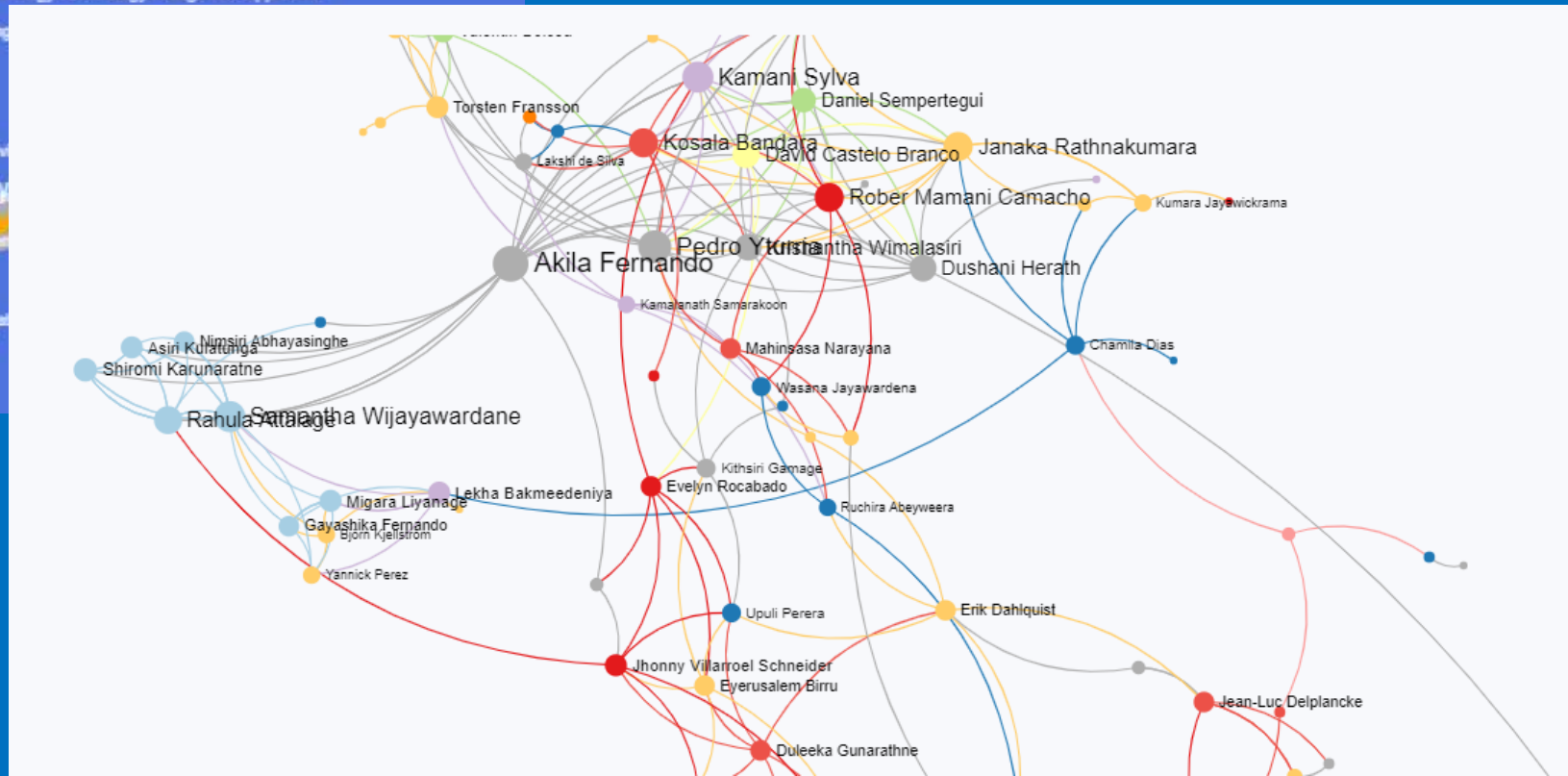
- ***Modules from (probably) 100+ teachers available***
- ***Programs (energy) to be started 2023:***
  - *MSc: Sri Lanka (4 universities); Cuba (4 universities); Bolivia (1 university)*
  - *"Diplomado": Bolivia (2 universities)*
  - *"Certificado": Brazil (2 universities)*
- ***Individual courses created by individual teachers***
- *Programs in preparation (2024): Bolivia, Cameroon, Ecuador, Ethiopia, Guatemala, Mauritius, Mozambique, Peru*

How can basic learningmaterial be used and reused?



How can Collaboration between Educators be done?

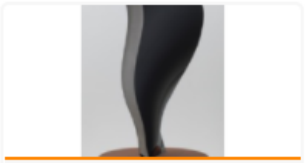


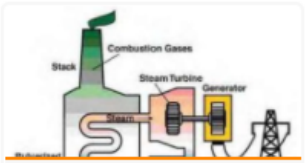


How can educators collaborate in detail?

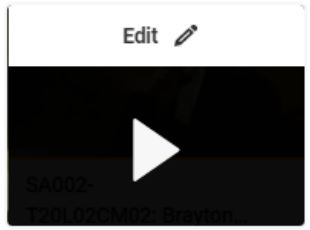
Stackable Master Energy › Energy Conversion Technologies › SA002-T20: Turbomachinery

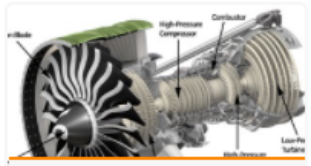
Date


SA002-T20L02CM05: Aerodynam...

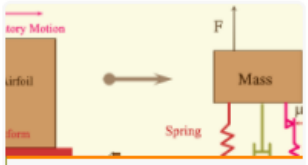


SA002-T20L02CM01: Fundament...




SA002-T20L02CM03: Turbojet Design, Turbofan...


SA002-T20L02CM04: Aeroderivat...



SA002-T20L02CM06: Vibration...


SA002-T20L02CM07: Aeroelasticity

thermodynamics, mechanical work and efficiency of Brayton cycle machines.

Stored in
MYPAGES

Type
Author module

Last updated
Feb 16 2022

More info ›

Share

Update SCORM-package

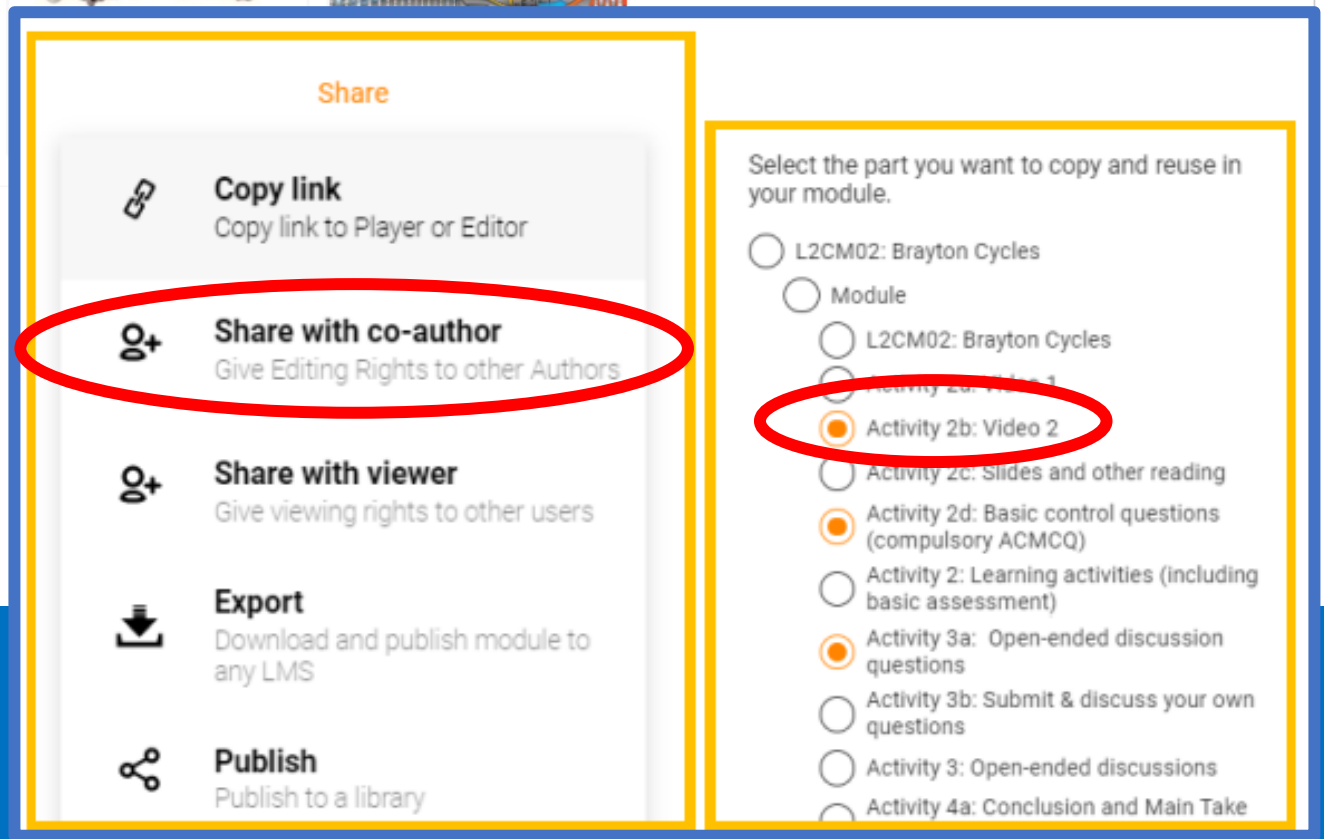
Move resource

Create copy

Unpublish

Manage social data

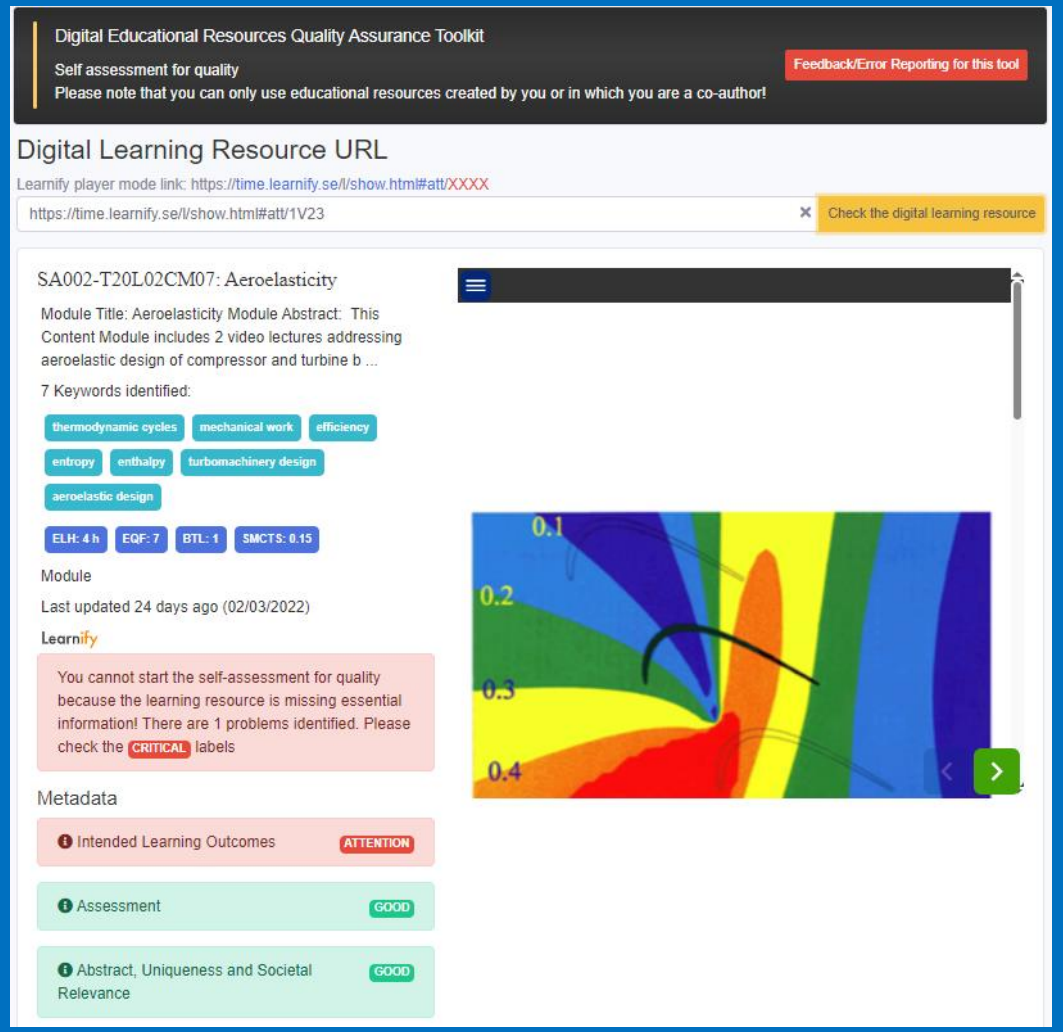
Move resource to Trash



Creative commons licenses for reuse in open "not for profit" collaboration

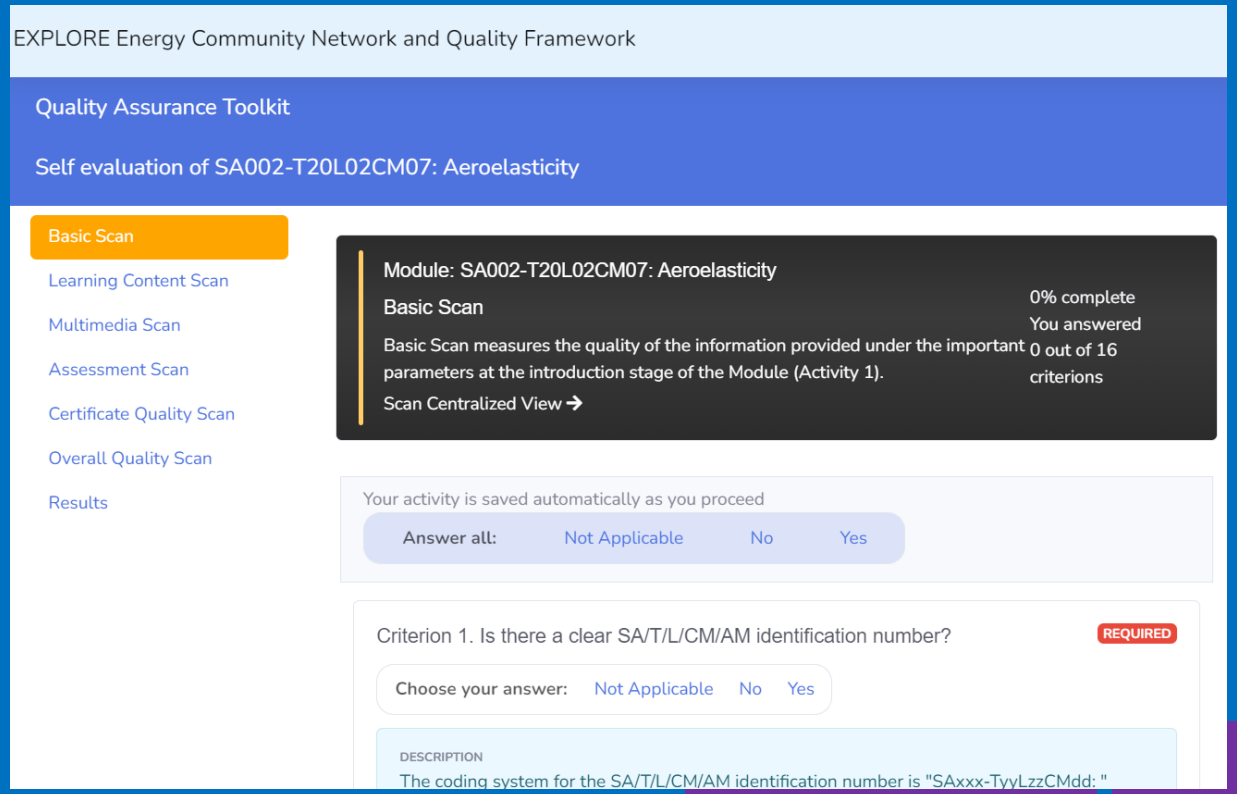
And what about quality?

- **Each learning resource goes through a self-evaluation, receiving a “Basic badge”**
- **A peer review can result in a “bronze”, ….., “Gold”, “Diamond” badge**
- **Example: https://eusl.monitorboard.nl/quality-main.php?developer; SA002-T20L02CM07: Aeroelasticity - Learnify**

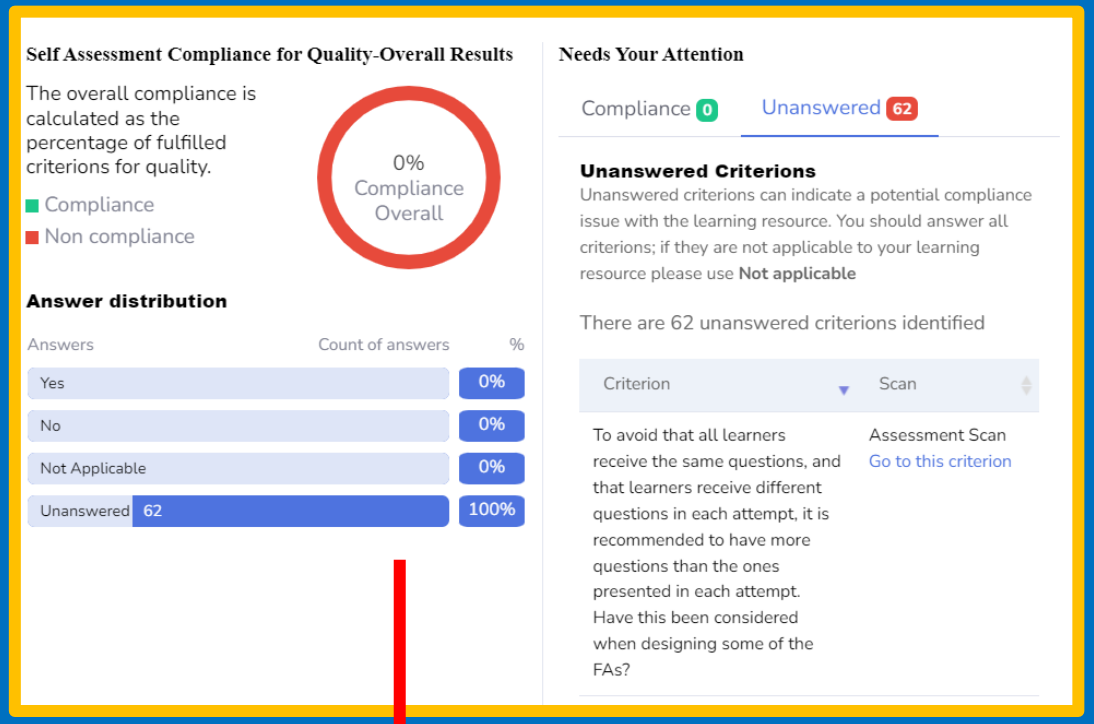


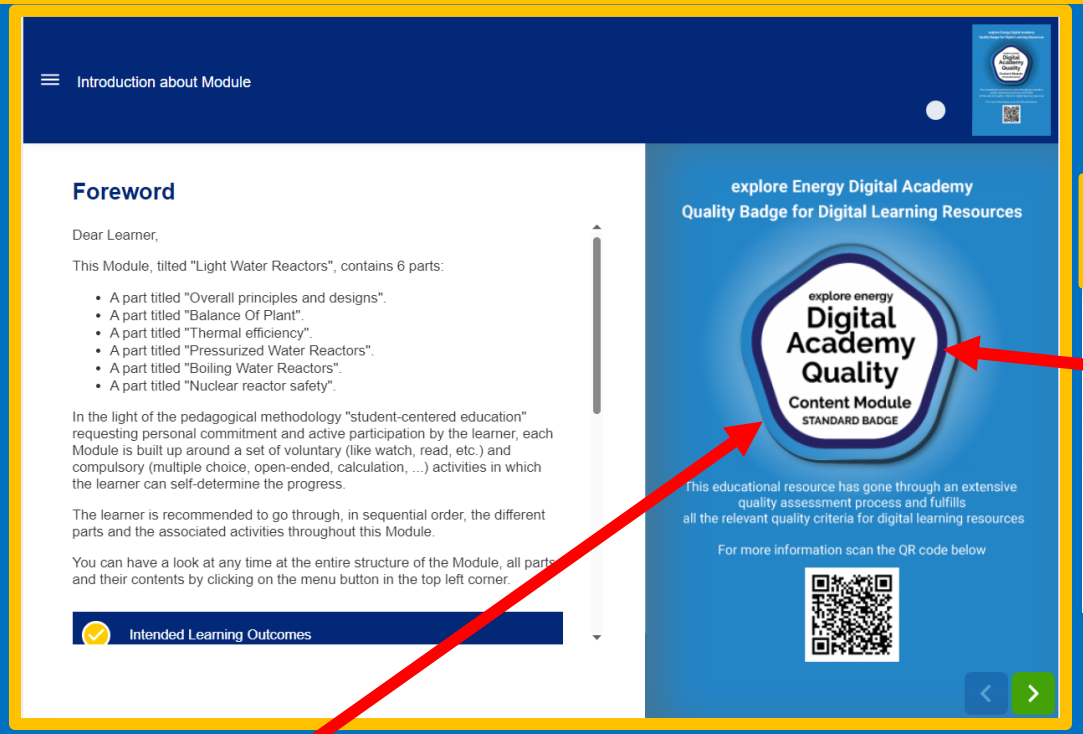
Self-Evaluation & Peer Review Based upon EIT Label Handbook

(European Institute of Innovation and Technology)



Quality Improvement Process: Result and badges





After review

Great work! The learning resource has passed the initial quality checks!

The learning resource satisfies the compliance requirements and you can invite external reviewers for quality.

Please note that inviting external reviewers function is not yet available. Your self-evaluation results are saved and you will be able to come back later and invite external reviewers.

Your learning resource earned the Standard Quality Label! Congratulations!

Download the quality badge

- **The badge is accessible to everyone and contains all the necessary “Meta-data” for quality.**
- **Next step: Include feedback from students**

EEDA: Intended for "Flipped Classroom" (SA002-T20L02CM02: Brayton Cycles – Learnify)

Activity 2: Learning activities (including basic assessment)

1

To fully assimilate the learning intended in this mod… learner is recommended to listen to the recordings, read the accompanying lecture slides, answer, and reflect upon, the Assessment Questions presented.

- Activity 2a: Video 1
- Activity 2b: Video 2
- Activity 2c: Slides and other reading
- Activity 2d: Basic control questions (compulsory ACMCQ)

Activity 3 :Open-ended discussions

3b

This activity gives a possibility to reflect upon a set of, for the content module … Open-Ended Questions and discuss these with peers. It is also a …on for the (for students registered for academic credits: compulsory) …ssion :

The activity consists of:

- reflect upon, and respond to, the presented Open-Ended Questions (OEQ)

- Activity 3a: Open-ended discussion questions
- Activity 3b: Submit & discuss your own questions

Bob Kielb

4

Professor of the Practice in the Department of Mechanical Engineering & Materials Science

Robert Kielb has over 45 years academic, industrial and government research laboratory experience in turbomachinery propulsion. This consists of 8 years with the U. S. Air Force, 10 years with NASA Lewis Research Center, and 12 years with GE Aircraft Engines as Manager of …bomechanics Technology. He has also been an Affiliated

Activity 2d: Basic control questions (compulsory ACMCQ)

2

Question 1 of 5:

For a Brayton cycle machine the change in entropy in a component is a function of:

- Temperature ratio, pressure ratio, and gas constants
- The lower calorific value
- The change in enthalpy
- Only the gas constants

3a

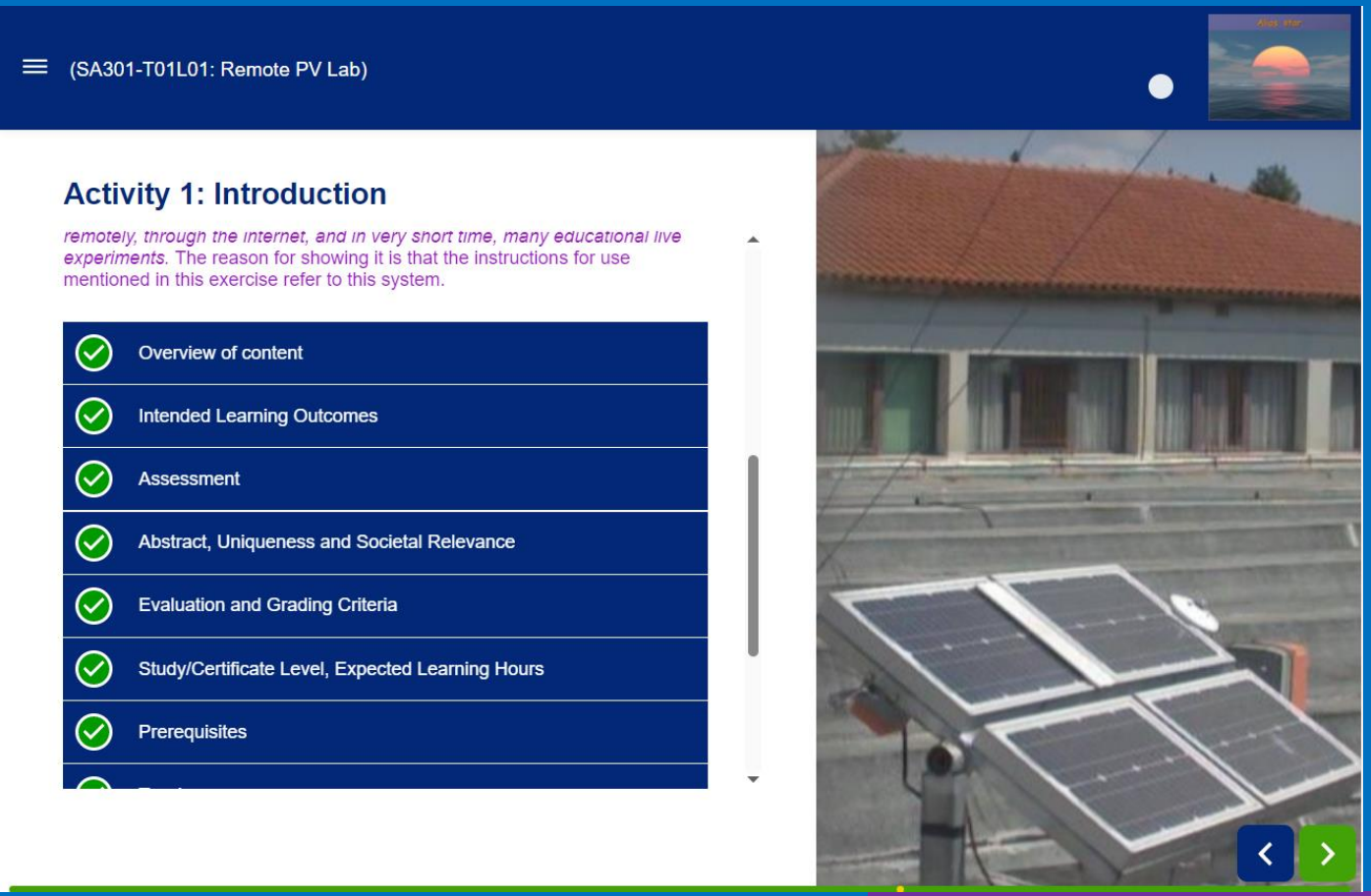
This sequence is locked

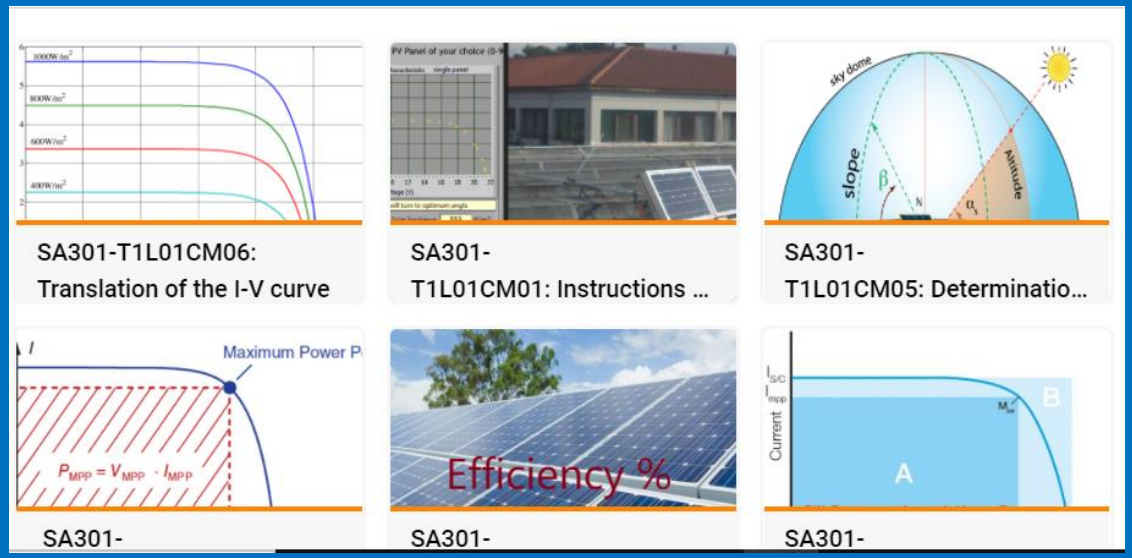
You have to complete the previous sections.

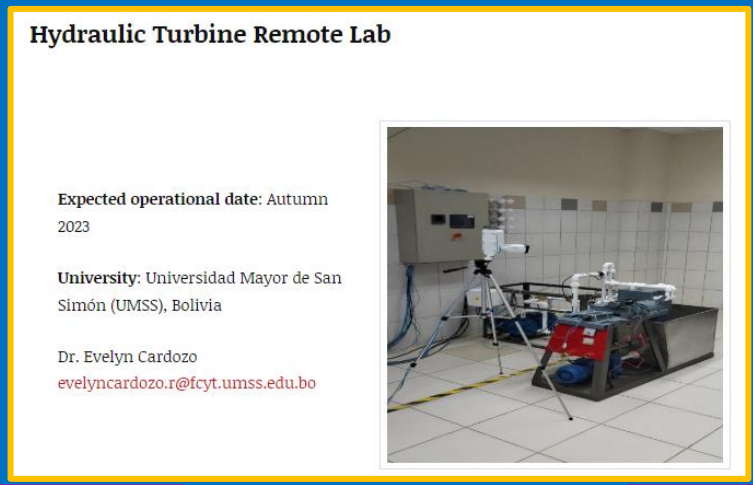
5

EEDA: Intended for “Laboratory exercises”

- **A set of 20+ “Remote labs” in energy are under preparation (7 up running presently)**
- **These will allow a user “anywhere” to perform a lab “in real time” via remote access (SA301-T01L01: UniWA Alios Star Remote PV Lab - Learnify)**



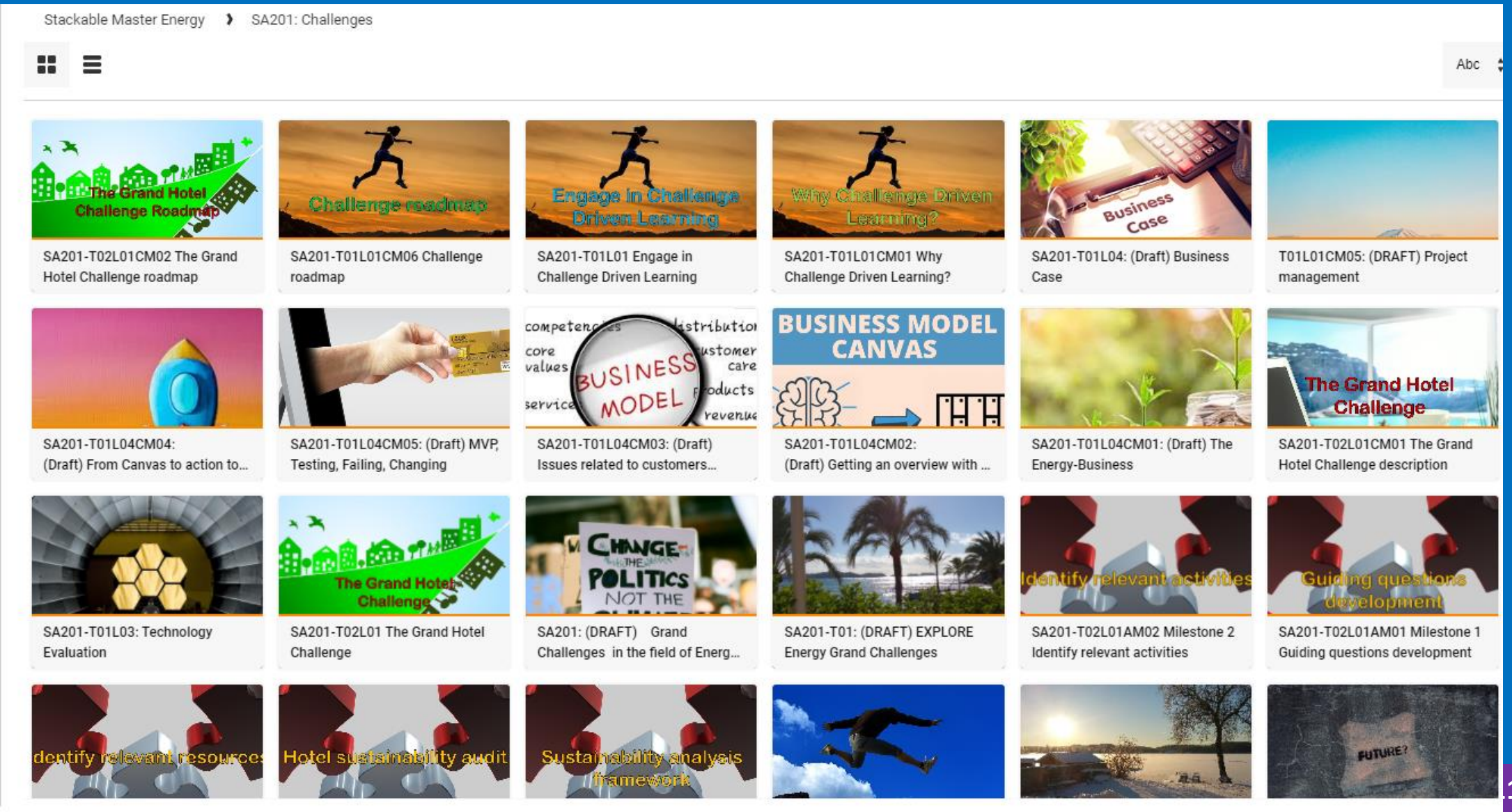




EEDA: Intended for Challenge-Driven Learning

Basic material for challenges available: Business Models; Pitch Training; Team Work; Technology Evaluation; ….

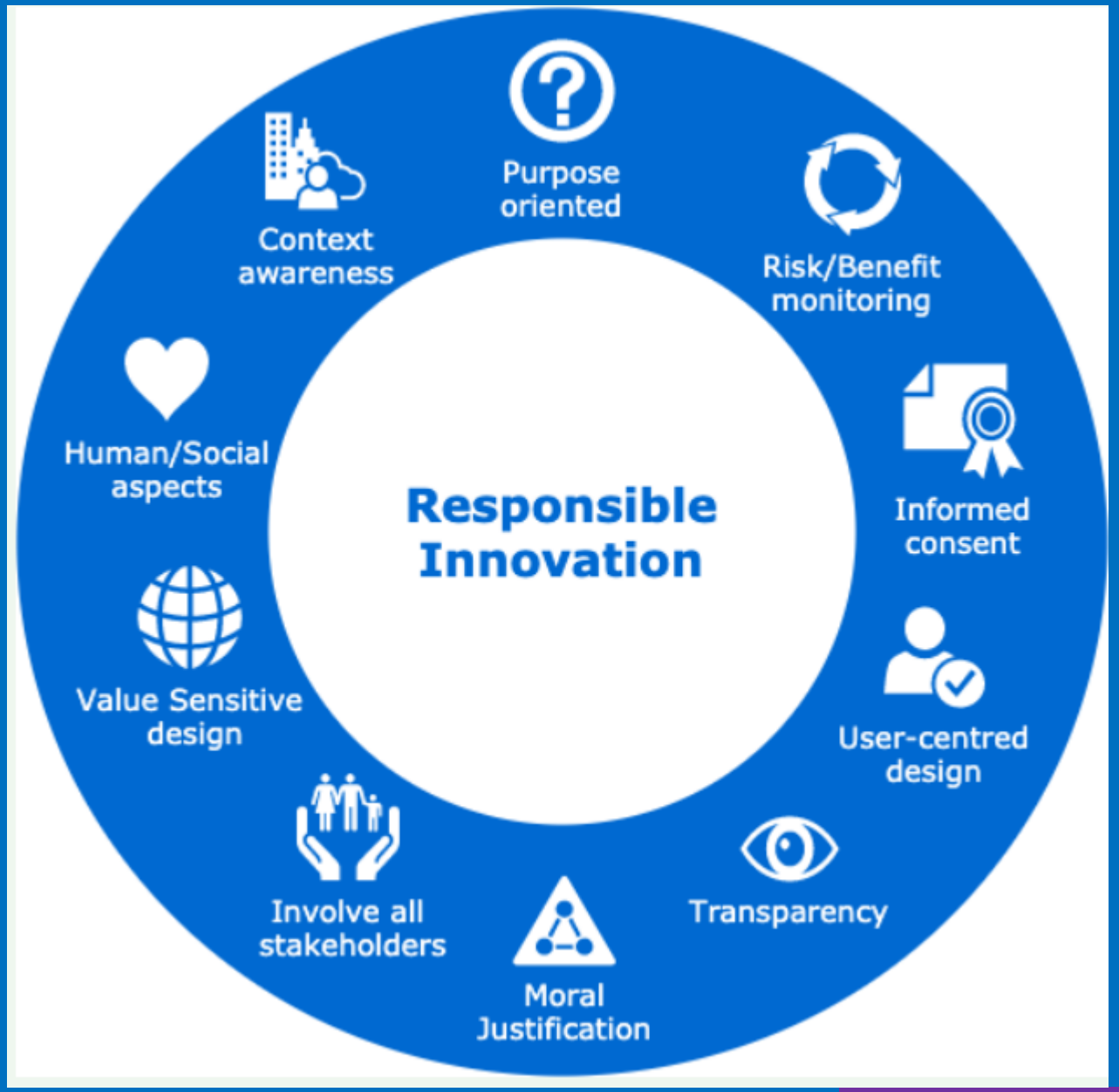
First Challenge in Sri Lanka (4 universities, 150 students) on March 15: “Hotel sector”



EEDA: Intended for Entrepreneurship

Learning material on:

- 21st Century Skills
- Pitch Training
- Start your Energy Company
- Evaluate Existing Technology
- Professional Responsibility & Ethics



EEDA: Intended for Case Studies

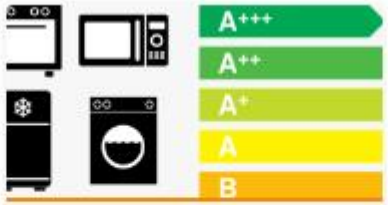
Case studies is an excellent way of learning

Case Study T1L01CM00: The Sant Cugat House...

Case st Knowin

Electrochemistry T1 L10 CM0: Case Study...

Electrochemistry T1 L10 CM1: Task one - Car...



Electrochemistry T1 L10 CM2: Task two - Daily...

Electrochemistry T1 L10 CM3: Task three - Cost...

Electrochemistry T1 L10 CM4: Task four - Change ...

SA101-T01L09: Energy storage optimization in...

SA101-T01L09CM01: Introduction to the speed...

SA101-T01L09CM02: Energy storage...

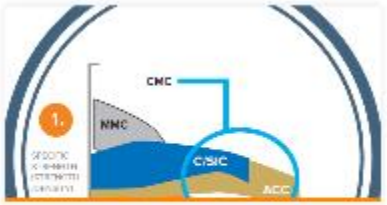
SA101-T01L09CM03: Introduction to energy...

SA101-T01L09CM04: Optimization techniques...

SA101-T51L01: (DRAFT) Case Study Gas Turbines ...

SA101-T51L01CM01: (DRAFT) Case Study Jet...

SA101-T51L01CM02: Case Study (DRAFT) Anticipate...



SA101-T51L01CM03: Case Study (DRAFT) Hot plates...

SA101-T51L01CM04: Case Study (DRAFT) Pelton...

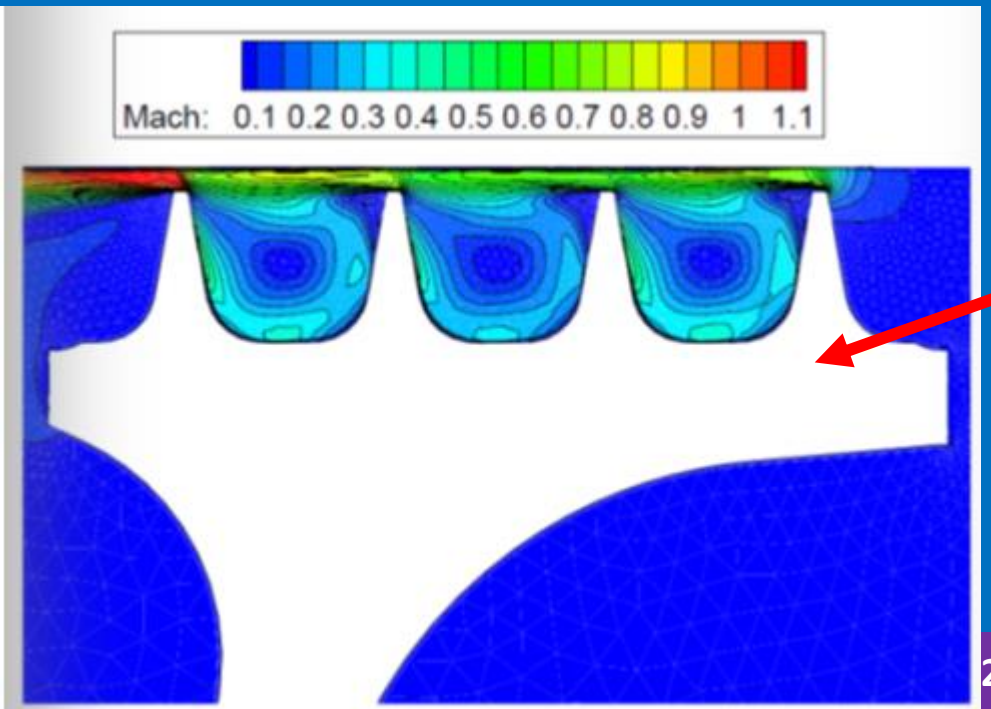
EEDA: Intended also for 3rd cycle

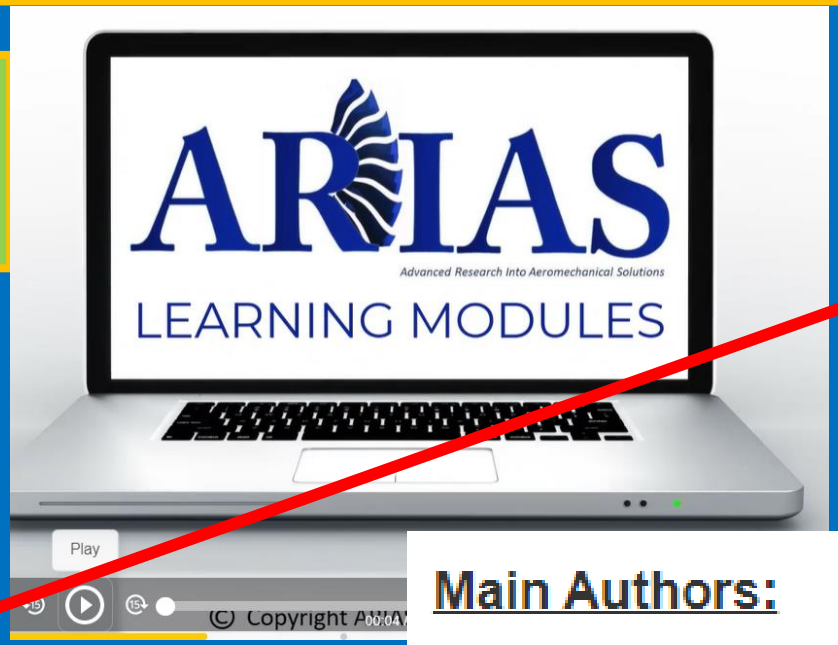
Specialized courses on PhD level are hard to find:

- ✓ Few students per supervisor / year => high-level courses are not developed
- ✓ Joining forces: Material reused => worthwhile to develop

Collaboration on education:

- ✓ Competitive edge while applying?
- ✓ Horizon2020 project: ARIAS





World-wide unique learning material on seal flutter in turbomachinery

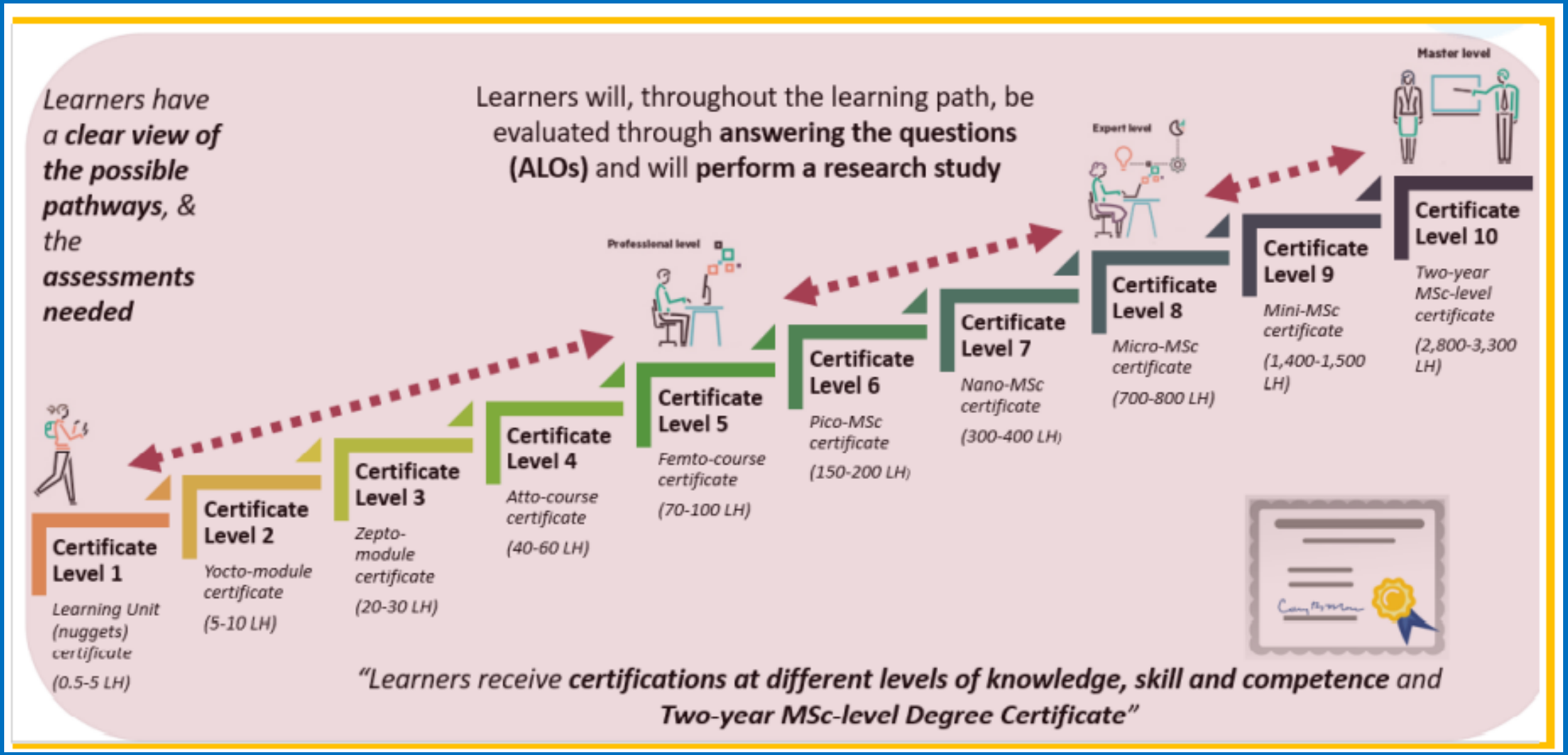
Main Authors:

- Richard Setchfield (Rolls Royce plc), Christoph Schwingshackl (Imperial College), Tom Mace (Imperial College), Detlef Korte (MTU), Roque Corral (UPM), Michele Greco (UPM)

2023: Collaboration in ed

EEDA: Intended to build own learning journeys

- **Combining modules/lessons will enable receiving certificates that can lead to a broad learning journey**



EEDA: Intended for “Certified Educators”

EEDA Certified Educator

There are two ways of becoming an “EXPLORE Energy Digital Academy Certified Educator”

1: Having participated in, and strongly contributed to, the original development of the EEDA Quality Improvement Process in the concept.

2: Proving the capability to develop learning material that are fully compliant with the QIP. The following must be achieved:

i: Development and “QIP Self-evaluation” of 20 modules as per the QIP.

ii: Peer Review received of at least 3 own modules from 3 reviewers each with an average score of at least 3.5 with no criteria below 3.0

iii: Performed own Peer Review on at least 5 “Modules” and at least 3 “Lessons/Topics” from other authors

iv: Peer evaluation by 3 previous “EEDA Certified Teachers” of “proof of evidence” of the material under 2i-2.iii.

An EEDA Certified Teacher does not have a “position” in EEDA. The certification is entirely based upon the quality of the work performed as per above.

And for students: How can (*presently*) BSc/MSc/PhD students use the material?

- **Fully self-learning:**
  - ✓ Access to the whole repository to select the own learning journey (modules, lessons, topics, etc)
  - ✓ Eventually team up with students with similar interest to learn commonly
  - ✓ Learn and create their own "Automatically corrected certificate"
- **Partially self-learning:**
  - ✓ Find modules/courses and contact the teacher to look at possibilities to participate in the class next time it is given
- **Participating in a class at the "home university"**
  - ✓ Teacher recommends a specific link to the students (SA002-T20L02CM02: Brayton Cycles)
  - ✓ Then teacher performs live discussions
- **Similar in the case of "Professional learning" as part of a "Short course"**
- **And various other ways**

Conclusion

- Framework for collaboration exists (Pilot: Circular Economy towards Energy)
- System built up around “small learning resources” (up to max 5 ELH for easy reuse)
- All Learning Resources contain academic metadata (ILOs, Credit levels, Assessments, …..)
- Quality Improvement Process to enhance quality, CDL, “Flipped Classroom”, …
- Teachers can collaborate for enhanced quality and reduced workload
- “Global but Local”: Teachers can “shop around” and create their own “teaching lists”
- All material can be used by students, with individual “play lists”

Acknowledgement

The opinions expressed are the authors alone, but based upon:

- **Contributions from 200+ teachers over the years**
- **EU including EIT, Life-Long programs, Framework programs during many years**

- **More recently Erasmus+ Capacity Building in Higher Education**
  - **EUSL-Energy**
  - **EUBBC-Digital**
  - **EU-BEGP**
  - **EDU-ABCM**

Are we ready for take-off towards „Education 4.1"?

Cascade lab movie

Fransson.kth@outlook.com