Teaching LCA in various economic sectors: similarities, discrepancies and innovation

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Context – Teachers' challenges and strategies

Engineering sciences + LCA

But LCA: abstract and a lot of notions

Cleaner production
Sustainable development
Complex to teach

Teachers’ strategies

Lecture
Tutorial
Practical work
Personnal work

Stakes, origins and basis
Methodological key points
Case studies
Software
Do these strategies be sufficient to enable the students’ appropriation?

LCA students’ appropriation:

- The understanding of LCA methodology
- The perception of LCA interests and drawbacks
- The willing to use LCA for ecodesign
- The understanding of limits between the software functions and the necessary human intervention and intelligence

Discussions in AgorAcv network:

- Identification of similarities, discrepancies and original ideas for LCA teaching
- Identification of the place and the role of LCA in engineering sciences learning and how it prepares students to consider environmental opportunities and constraints for their future jobs
Methods

Inventory of LCA courses and practices of AgorAcv’s teaching group based on 8 criteria:

- Degree
- Type of courses: lecture, tutorial or practical work
- Number of students
- Duration
- Educational goals
- Level to be reached (basic, medium, advanced)
- Deepening of a topic
- Type of case study
- Use and type of software

19 LCA courses for different degrees in different schools and universities with some similarities, discrepancies and original ideas
Similarities – The basis

Two main educational goals: the common basis to build a LCA course

Performing a simple LCA

- Understanding of LCA methodology, ability to achieve a case study and use of basic functions of LCA software
- Lecture, tutorial and practical work
- Around 10 hours, use of software (Simapro, ArtoGreen), ecodesign approach (sometimes)

Performing a more complete LCA for a specific industrial or economic sector

- Understanding of LCA methodology subtilities, ability to achieve a case study and use of advanced functions of LCA software
- Lecture and practical work
- Around 20 hours, use of software (Simapro, GaBi), ecodesign approach (always)
Similarities - The basis

Lecture:
- General LCA framework
- LCA methodological key points: functional unit, allocation rules, mass and energy balance
- Impact characterization principles: methods are not precisely described
- Results interpretation

Practical work and software:
- Need of a consistent course duration to understand limits of LCA software and the necessary human input for modeling and results interpretation
- Need of autonomy and thinking of the use of LCA
- Presentation of case study results thanks to a report or an oral presentation
- Need to go up an ecodesign approach
- Focus on the concerned industrial or economic sector
Discrepancies – Some original ideas

Four good but conventional proposals

**Level 1- Reading and understanding LCA study**
Lecture: framework and key points
Tutorial work: reading and criticizing LCA study thanks to an oral presentation with questions
Interest: students confrontation about LCA advantages and limits

**Level 2- Understanding of LCA methodology and the modelling of processes**
Lecture and practical work: immersive course during few days with a mini-case study
Interest: the exercise performing while progressing on the LCA methodology learning

**Level 3- Role-playing situation to perform LCA in complete autonomy**
Lecture: LCA methodology
Practical work: students have to perform a LCA study as if they were a part of a LCA-team company
Interest: understanding of LCA issues especially data collection and assumptions

**Level 4- Using models to supply LCA study**
Lecture: LCA methodology
Practical work: coupling between LCA and economic or process simulation models
Interest: tools interoperability in ecodesign perspective
Discrepancies – Some original ideas

Three original proposals

Level 5- Students become teachers
Lecture: LCA framework and key points
Interest: the best appropriation

Level 6- LCA 2.0
Lecture: LCA methodology
Practical work: use of digital tools as web application
Interest: more autonomy and freedom, easy and quick performing of LCA case study

Level 7- Ecodesign of a system
Lecture: different disciplines not only LCA
Practical work: a complete approach of ecodesign for a case study
Interest: the real professionnal life but not a current practice in LCA training
Take home message for educational needs and innovations

Towards a best appropriation

Students should build their knowledge (flipped classroom, role playing) about:
- Environmental impacts
- LCA methodological key points by using exercises and mini-case study

Essential multidisciplinary of LCA practice

Proposal of an ecodesign case study within a larger module including different disciplines (mechanics, physics, heat science, economics, …)

Communication challenge

Methods for results interpretation to help students or junior LCA practitioners to treat the abundance of LCA and ecodesign data and results

Be aware of LCA difficulties

Teachers’ strategies to overcome the lack of time do not entrave the understanding of LCA difficulties (data collection, assumptions, system modelling, …)
Thank you for your attention