Insights from a sustainability-oriented academic bachelor program in a Caribbean Small Island State: evaluation of SISSTEM using the GreenComp Framework.

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International Conference on Sustainable Development 2023
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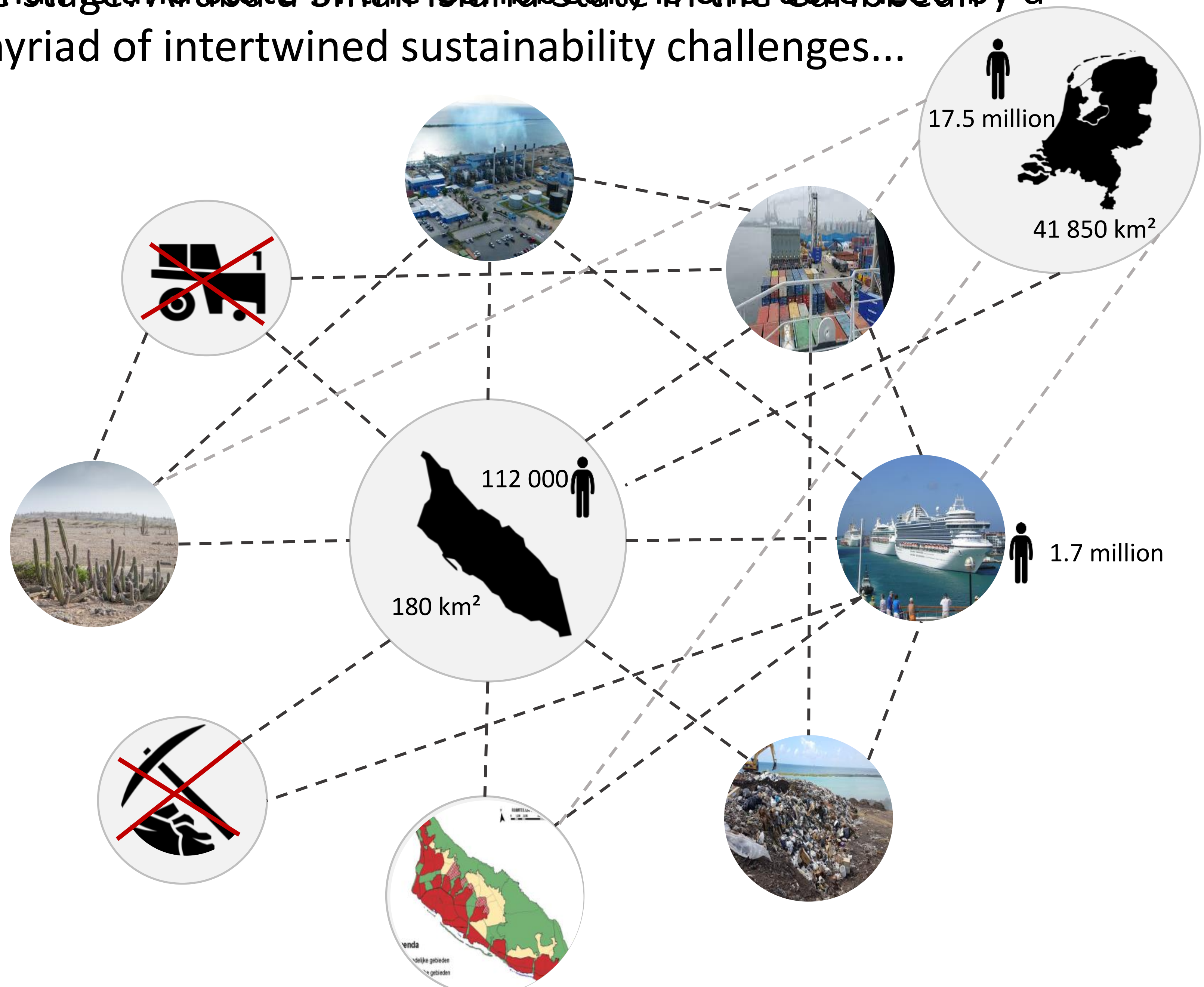
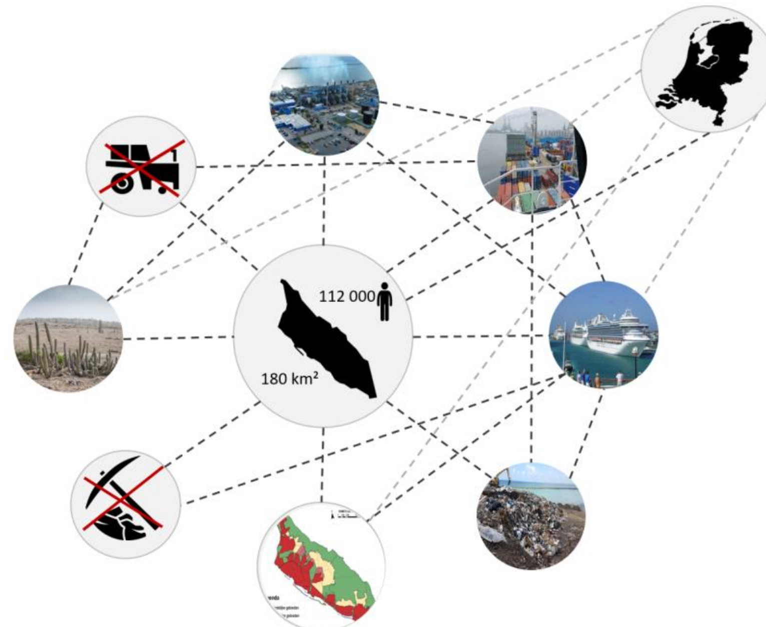
Setting the stage: Aruba a Small Island State in the Caribbean

Aruba, a small island state in the Caribbean, is characterized by a complex myriad of intertwined sustainability challenges...



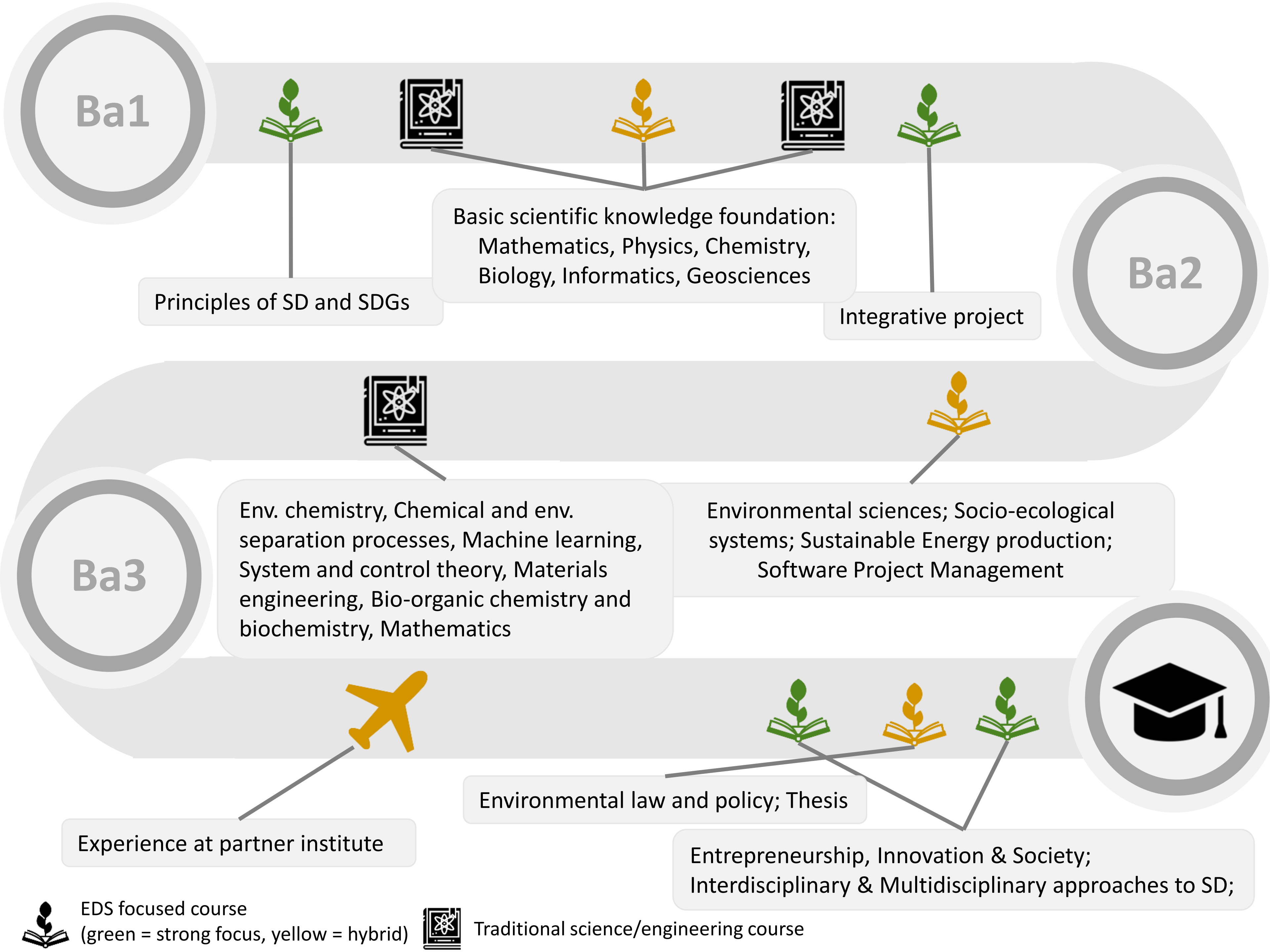
Independent, quick-fix technological solutions, developed with a continental mindset, do not always turn out well and lead to loss of financial capital

Brain drain of local talented youth

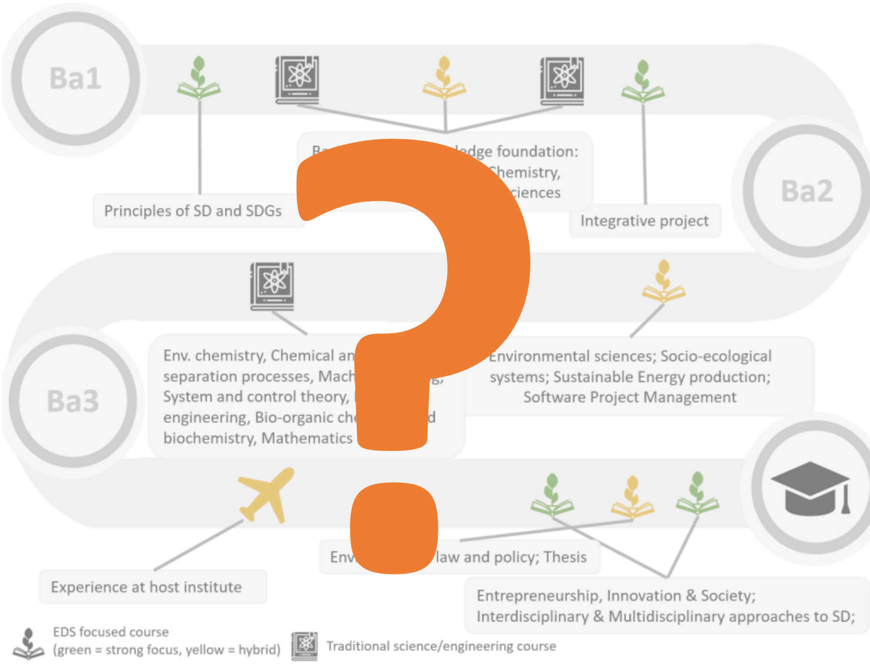


SISSTEM
Sustainable Island Solutions through STEM

- Bachelor program
- Master program
- Research program



Ba1
Ba2
Ba3
Principles of SD and SDGs
Basic scientific knowledge foundation: Mathematics, Physics, Chemistry, Biology, Informatics, Geosciences
Integrative project
Env. chemistry, Chemical and env. separation processes, Machine learning, System and control theory, Materials engineering, Bio-organic chemistry and biochemistry, Mathematics
Environmental sciences; Socio-ecological systems; Sustainable Energy production; Software Project Management
Experience at partner institute
Environmental law and policy; Thesis
Entrepreneurship, Innovation & Society; Interdisciplinary & Multidisciplinary approaches to SD;
EDS focused course
(green = strong focus, yellow = hybrid)
Traditional science/engineering course



This is how the program was designed.

To what extent is the program actually equipping students with ESD competences?

- According to the lecturers?
- According to the students?

To what extent is the SISSTEM program actually equipping students with ESD competences?

Evaluation of the SISSTEM Ba program

Discussion and future steps

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Evaluation of the SISSTEM Ba program

The GreenComp Framework
Semi-structured interviews with lecturers
Survey with students

Discussion and future steps

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Discussion and future steps

Greencomp: The European sustainability competence framework

Four areas…. each with three competences

From: Bianchi *et al. 2022*

Greencomp: The European sustainability competence framework

Each competence is linked to a series of knowledge, skills and attributes statements

For example:

Competence	Knowledge, Skills, Attitude statements for each competence
Valuing sustainability	Is prone to acting in line with values and principles for sustainability
Supporting fairness	Is committed to decreasing material consumption
Futures literacy	Is aware that the projected consequences on self and community may influence preferences for certain scenarios above others.
Adaptability	Is willing to discontinue unsustainable practices and try alternative solutions.

To what extent is the SISSTEM program actually equipping students with ESD competences?

Evaluation of the SISSTEM Ba program

- The GreenComp Framework
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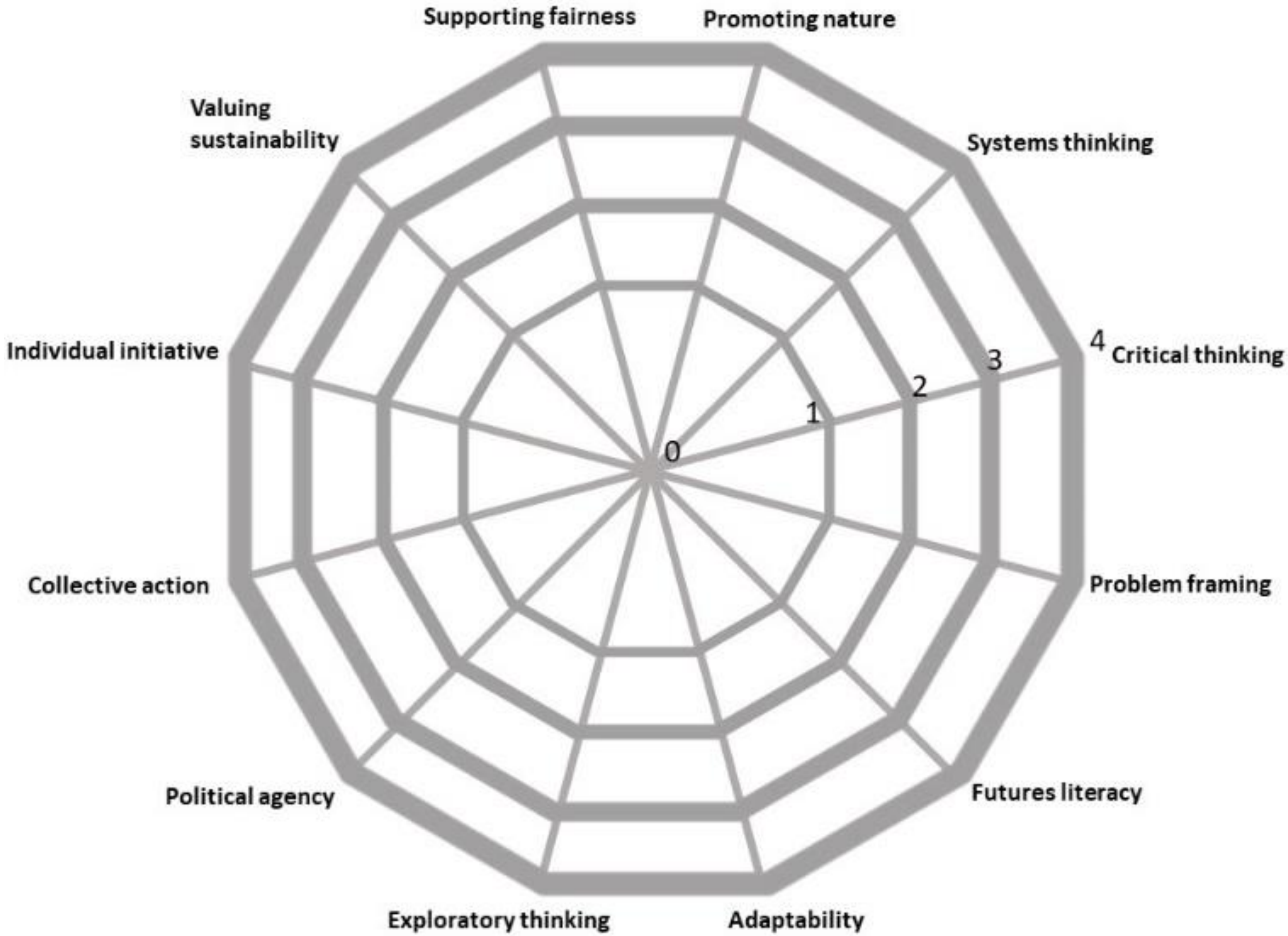
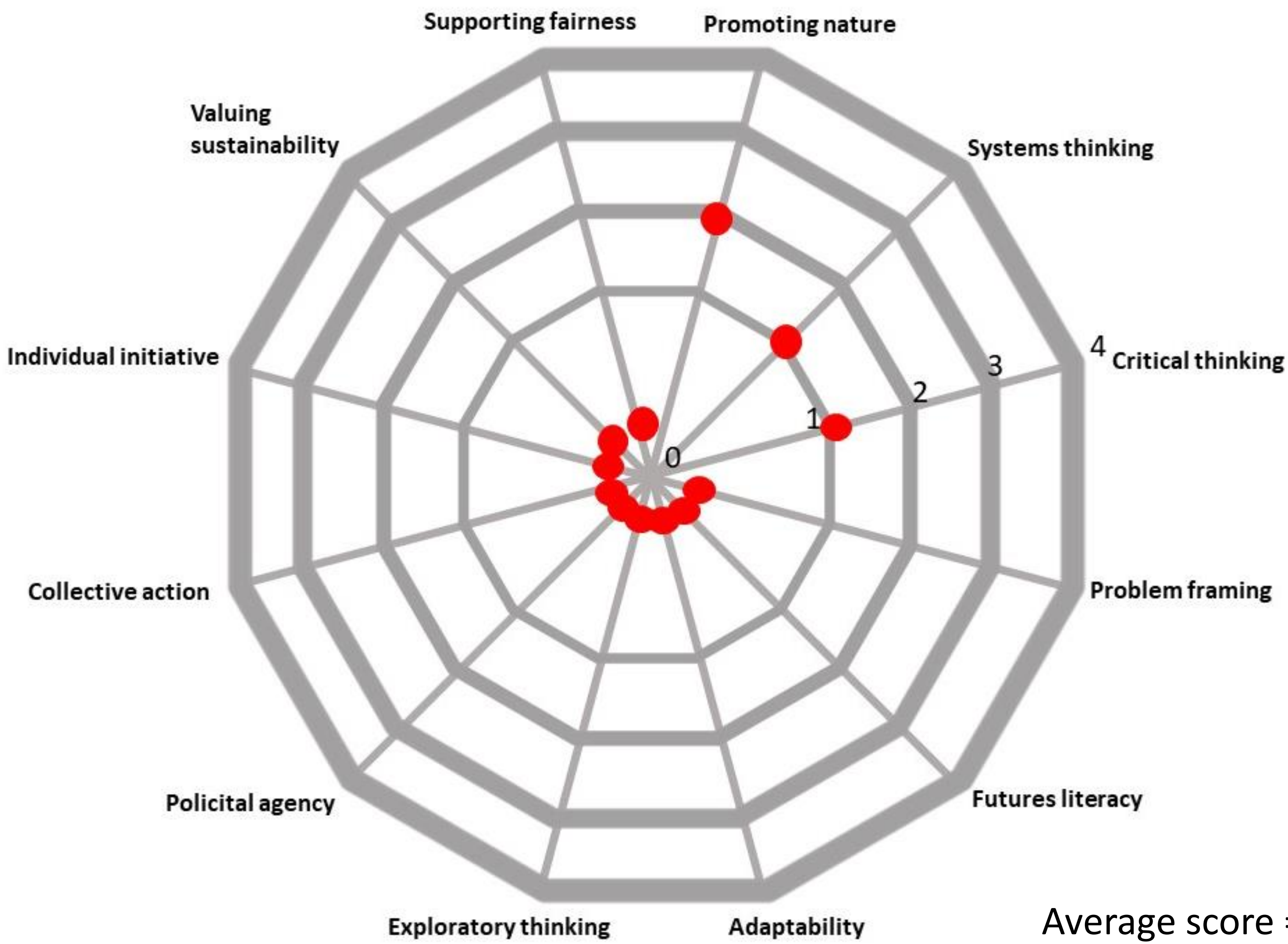
Discussion and future steps

Spider-web based exercise / interview with lecturers

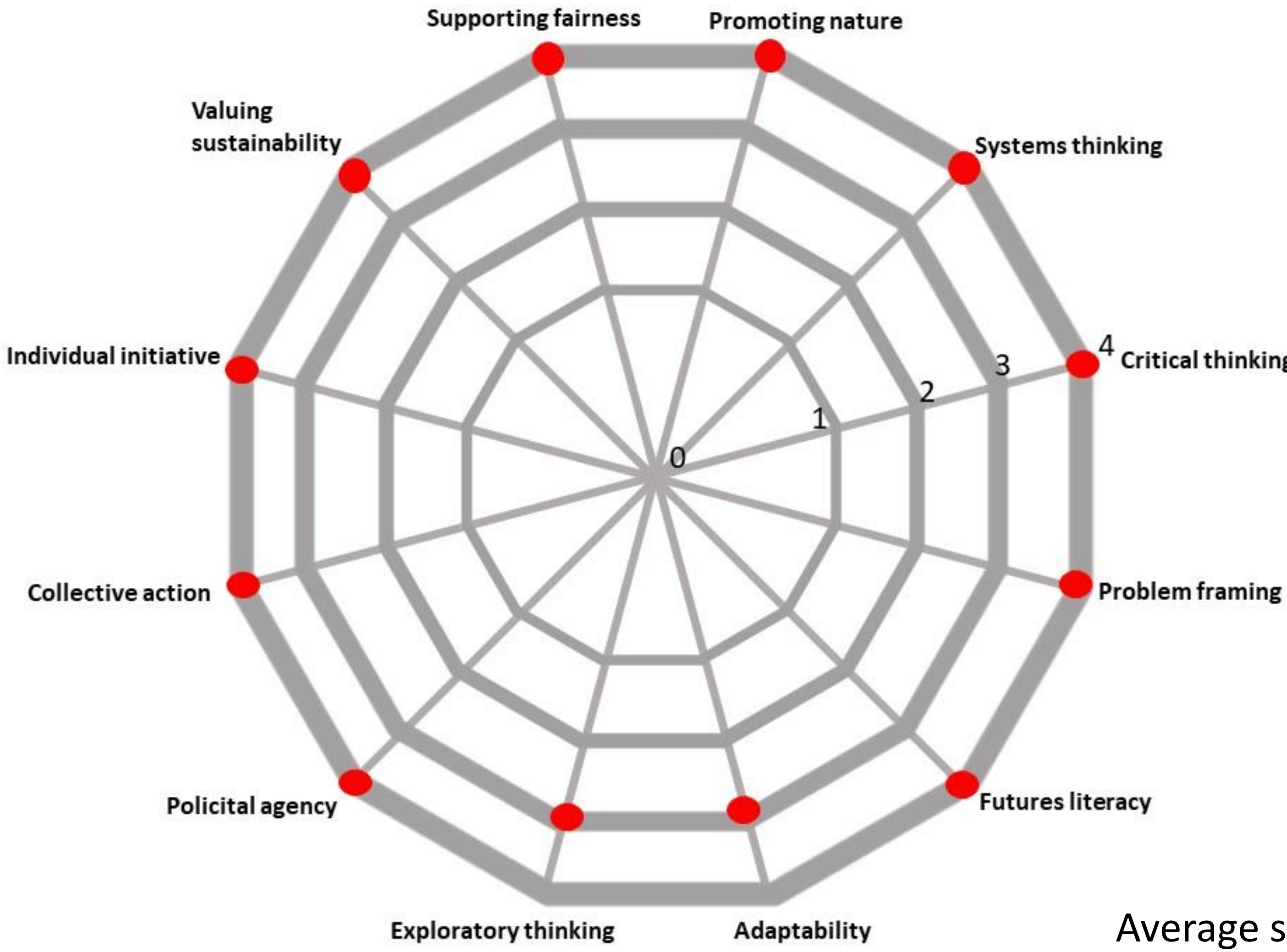


Bio-organic chemistry and biochemistry



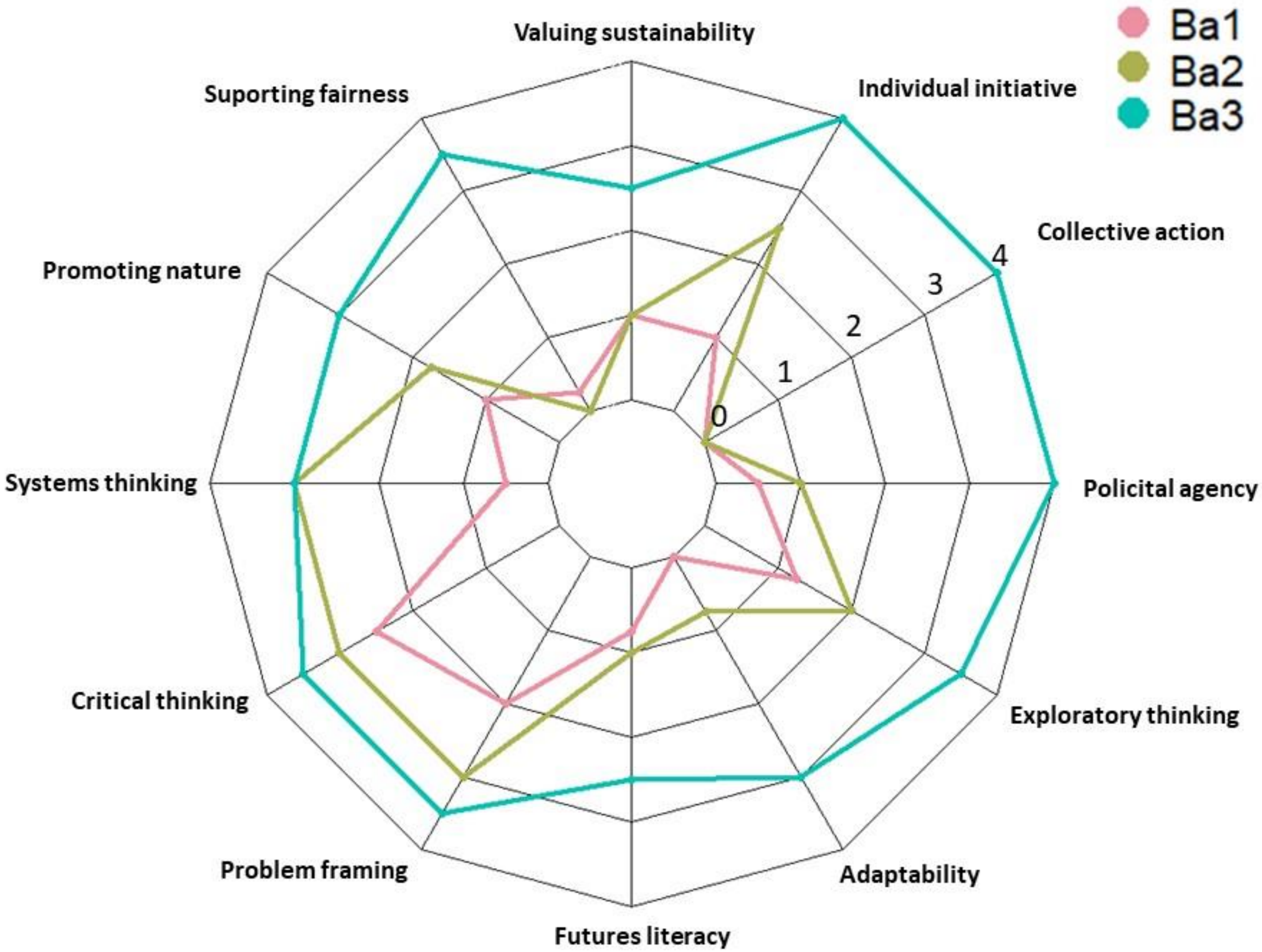
Average score = 0.33

Interdisciplinary and multidisciplinary approaches to sustainable development



Average score = 3.8

Median Greencomp competences scores increase when going from Ba1 to Ba3



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Student survey

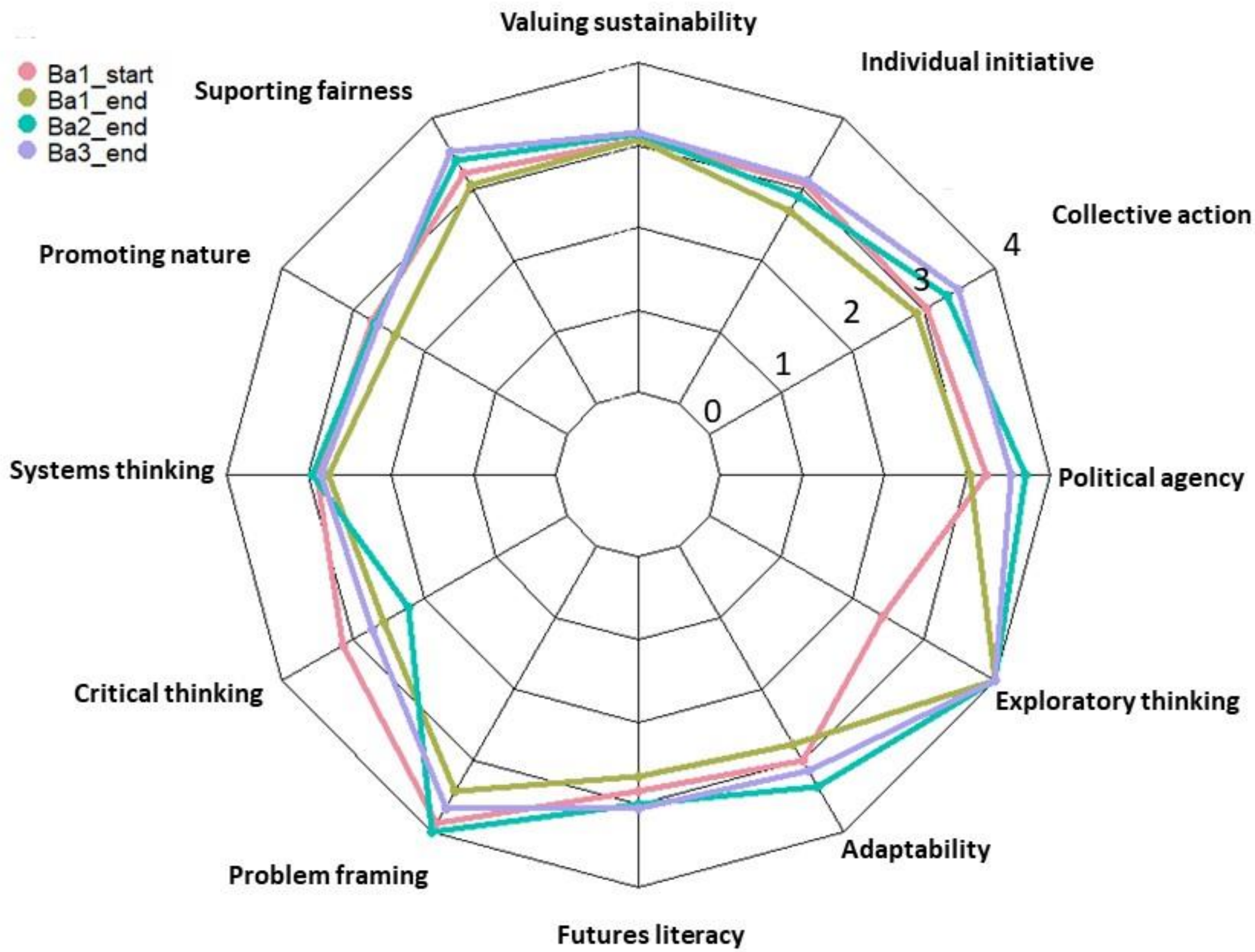
Program students	Number of respondents	Average response rate (sd) (%)
Ba1 start academic year	9	95 (5.94)
Ba1 end academic year	7	84 (20.77)
Ba2 end academic year	2	90 (14.73)
Ba3 end academic year	6	93 (6.78)

Every question was linked to one or multiple of the knowledge, skills and attitudes statement

Scoring on each question:

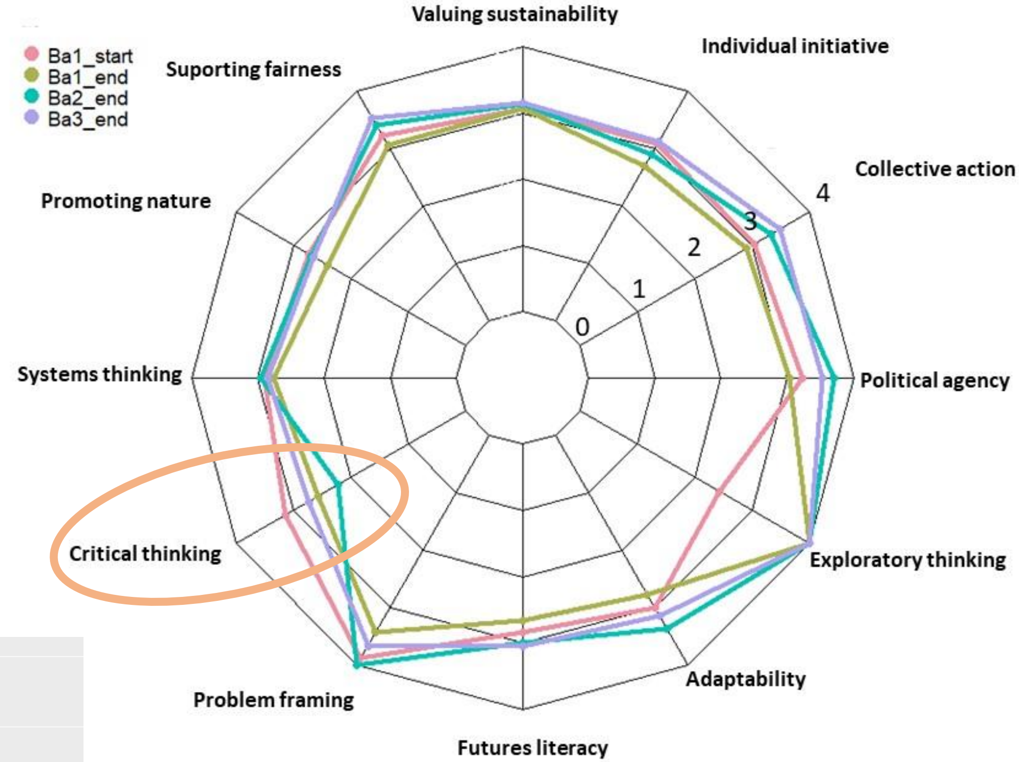
- Ranged from 0 (strongly disagree) to 4 (strongly agree) for Likert-type questions,
- 0 or 1 for sustainability-association questions,
- 0 or 4 for knowledge-type questions
- Rescale score to a maximum score of 4

Students score high on all competences



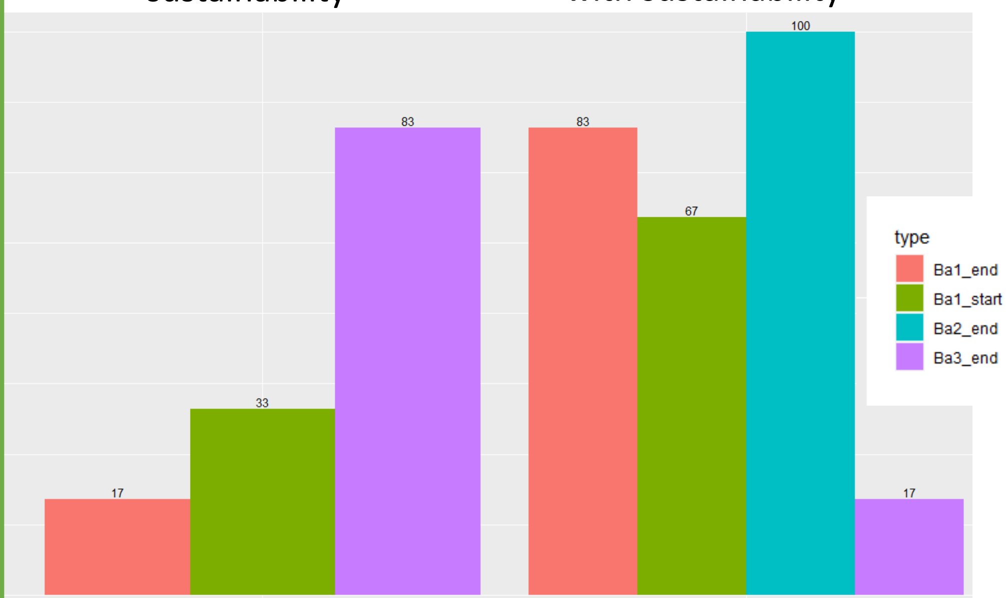
Counter-intuitive / unexpected results

Drop in critical thinking from start Ba1 to Ba3



I DO associate "plastic" with sustainability

I DO NOT associate "plastic" with sustainability



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Discussion and future steps

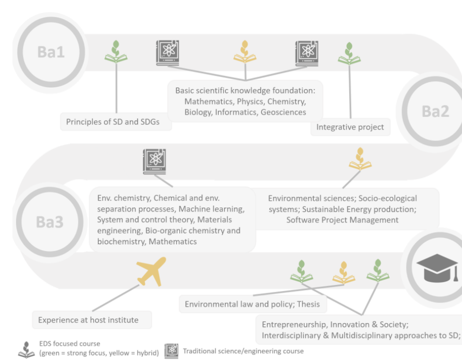
GreenComp framework is comprehensive framework and can help in guiding evaluations of programs

We could find strong similarities between the original SISSTEM Bachelor program design on ESD and the evaluations by the lecturers

- Semi-structured interviews with spiderweb worked well

We could not find conclusive results on the students' ESD competences progress throughout the curriculum

- We need to develop new evaluation methods and tools for longitudinal analysis of student's competences progress throughout the curriculum



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	Semester 1		Semester 2	
Ba1	Principles of sustainability and SDGs		Integrative project	
	Mathematics 1	Basics of physics	Mathematics 2	Applied Biological Sciences
	General chemistry	Geosciences	Introduction to informatics	Physics: electromagnetics
Ba2	Environmental sciences		Elective courses within specialization	
	Bioorganic chemistry and biochemistry	Bio-economics		
	Materials engineering	Mathematics 3		
Ba3	Lab work specialization		Environmental law and policy	
			Entrepreneurship, Innovation & Society	
	Specialization at host institute		Interdisciplinary and multidisciplinary approaches to sustainable development	
			Thesis	

Elective courses Bio-environmental sciences	Ecophysiology
	Environmental Chemistry
	Socio-Ecological Systems
Elective courses Information & Data sciences	System and Control Theory
	Machine learning
	Software Project Management
Elective courses Technology and Engineering	Chemical and Environmental Separation Processes
	Sustainable Energy Production
	Automation and Process Control