ENGAGING STUDENTS IN SDG 14 BY PLACING THEM AT THE CENTRE OF THEIR OWN LEARNING: SDG214 AT THE UNIVERSITY OF BERGEN AS AN EXAMPLE

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Abstract

Educating students on the sustainable development goals (SDGs) calls for teaching where students are at the centre of their own learning. Sustainability questions are 'wicked problems', where no single, correct answer exists, but the answers depend on the values of those who answer, and require innovative pedagogy and active, action-oriented learning to allow the learners to think critically and engage in exploring sustainable futures. In line with the other SDGs, SDG 14 (Life Below Water) provides an excellent focus area for teaching and learning. The course, SDG 214, at the Department of Biological Sciences at the University of Bergen is a 10 ECTS credit interdisciplinary course where the students work in teams, and the portfolio assessment includes essays, presentations, a debate, a poster and a short paper, but no exam. The assessment is formative, and the students get feedback on their individual and group assignments and are allowed to resubmit. The course culminates in a poster session organised together with three other courses. In the two years the course has been running, 85% (2019) and 94% (2020) of the students have been satisfied with the course, even though they consider the required workload and expectations high. The student evaluations also suggest that the assignments function very well to develop students' critical thinking skills, which is essential for education on sustainable development.

Sustainability education

Educating students to respond to the sustainable development goals (SDGs) calls for teaching where students are at the centre of their own learning, through learning methods such as problem-based learning, role plays and simulations, group discussions, debates, and case studies (Byrne 2000; Cotton and Winter 2010; Tilbury 2011; UNESCO 2018; Wiek et al. 2011). Sustainability questions are often 'wicked problems' (Rittel and Webber 1973), where no single, correct answer exists, but the answers depend on the values of those who are asked. Education that is centred on such questions requires innovative pedagogy and active, action-oriented learning allowing the learners to think critically and engage in exploring sustainable futures (UNESCO 2018; SDSN 2020).

Motivation for the University of Bergen course on Sustainable Development Goal 14: Life Below Water

The University of Bergen has a strong marine profile and was, in 2018, announced as both the official United Nations Academic Impact (UNAI) Hub for SDG 14, and as the leader of the SDG 14 Cluster for the International Association of Universities (IAU). However, as often happens, the establishment of a course on this topic at the University, identified as the SDG 214, course was strongly

based on a combination of knowledge and my personal motivation as the teacher of the course to teach on a subject of high relevance for students and society at large.

Course design and development

GENERAL PRINCIPLES

Active learning

Active learning implies that students are learning by engaging in (cognitive) activity, and constructing rather than receiving knowledge (Bransford, Brown and Cocking 2000; Chickering and Gamson 1987; Johnson, Johnson and Smith 1998; Prince 2004), leading to a deep approach to learning (Bevan et al. 2014). Active learning methods have clear learning benefits (e.g., Freeman et al. 2014), and transforming students into active players in their learning is particularly well suited for education for sustainable development (UNESCO 2018; SDSN 2020). It was therefore clear from the outset that the SDG 214 course would be based on highly student-active learning methods.

Constructive alignment

One of the benefits of designing a completely new course is the freedom it provides to pay attention to the really important issues, such as constructive alignment (Biggs 1996). Constructive alignment means that the intended learning outcomes, learning activities, assignments, and assessment need to be linked to each other. Starting from the end – "what do I want my students to learn?" – allows for the intended learning outcomes to articulate the teacher's intentions for the whole course (Biggs 1996; Boulton-Lewis 1995). In designing this course, I started by stating the intended learning outcomes (**what** do I want the students to learn?), then drew the alignment through learning activities (**how** is the students supposed to learn it?) to assessment (**how** am I going to assess how well the students have reached the intended learning outcome?). The intended learning outcomes and the associated assignments are listed in Table 1 and Table 2.

Authentic assessment

Authenticity in assessment means that the assessment method allows for testing the intended learning (Kearney et al. 2013). For example, it would feel quite meaningless if, for getting a driver's license, one would only write an essay or perform a multiple-choice test about driving a car, and not actually demonstrate that one can drive a car. Traditionally, assessment in higher education is often somewhat like this, with a written exam or a multiple-choice test at the end of the course, with potentially weak connections along the axis from learning outcomes via activities to assessment. When developing the SDG 214 course, I paid special attention to making sure that the assessment was as authentic as possible, for example by using assignments such as presentations, debates, peer-reviews, and reflective essays (see Table 1 and Table 2 for more details).

Formative feedback and assessment

Formative feedback provides information which intends to change the student's behaviour or thinking with the goal of improved learning (Shute 2008), while formative assessment implies that assessment is seen as part of the learning process (Sadler 1989; Nicol and Macfarlane-Dick 2006), not just a measuring tool for students' acquirement of intended learning goals (so called summative assessment, Taras 2005). Both methods are integral elements of the SDG 214 course. Feedback

is provided by both the teachers and teaching assistants as well as by peers (i.e., the fellow students). Peer feedback has positive effects on both the students providing the feedback and the ones receiving it (e.g., Boud et al. 1999), and the ability to give critical but constructive peer feedback is a central transferable skill for almost any thinkable career choice. Formative feedback and assessment, particularly when done throughout the whole course and not only at the end, give the students a realistic view of the level of their knowledge and skills and provides them with a clear view of what they still need to work on. This is an element that the student evaluations have shown the students to appreciate highly.

Learning outcomes, activities, and assessment

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has drafted general learning outcomes for SDG 14 (UNESCO 2017), but for the SDG 214 course an independent set of learning outcomes was designed (Table 1). Table 2 lists the assignments associated with the different learning outcomes and shortly describes the learning activities associated with a given learning outcome. The course is graded as pass/fail, but all assignments have in the first years been graded with points, and Table 2 lists the maximum points for each assignment.

Table 1: Intended learning outcomes, and which assignments are assessing students' achievement of them. The bold X shows the main assignment for a given learning outcome.

		ASSIGNMENTS *(SEE TABLE 2)*					
INTENDED LEARNING OUTCOMES		**1**	**2**	**3**	**4**	**5**	**6**
Knowledge	1. Explain physical and biological ocean processes that contribute to making the problems under SDG14 global		x				x
	2. Explain the history and contents of the most important international agreements and conventions relevant for SDG14		**X**				
	3. Describe the roles of key governmental and intergovernmental arenas for decision-making relevant for SDG14		x			x	
Skills	4. Analyse and interrelate SDG14 targets considering other SDG targets	**X**			x		x
	5. Find, navigate, and make connections between scientific literature and the literature of reports, conventions, and policy documents		x	x			x
	6. Identify stakeholders and analyse their motives			x	**X**		x
	7. Evaluate existing research and suggest research needs related to SDG14	x					**X**
General competences	8. Be able to compose and use scientifically grounded arguments for societally relevant debates			x		x	x
	9. Be able to provide peer feedback while balancing critical and constructive views		x	x	x		
	10. Identify and separate between scientific knowledge, values, beliefs, and ideologies			**X**	x	x	x

Table 2: Assignments, associated learning outcomes (see Table 1 for details; the number marked with bold is the main learning outcome for a given assignment), and the maximum points for each assignment.

ASSIGNMENT DESCRIPTION	SPECIFICATIONS	LEARNING OUTCOME(S)	POINTS
1. Identify SDG14 trade-offs and conflicts (group discussion, individual essay)	Individual essay discussing the trade-offs and conflicts of SDG14 with the other SDGs (500-1000 words).	4, 7	12
2. Agreements, conventions, reports, research (group presentation)	Each group chooses one of the SDG14 targets and tracks it back in time and prepares a 10-minute presentation to be presented in class.	2, 1, 3, 5, 9	12
3. Describe an NGO and its use of science (group discussions & presentation)	Each group chooses an NGO relevant for SDG14, and studies & discusses its use of science (web pages, publications, campaigns), and presents their findings to the class in 10-minute presentation.	10, 5, 6, 8, 9	12
4. Analyse stakeholders (group discussions, individual essay)	Write a 500-1000 word individual essay describing the stakeholders and their motives in the film 'Cod Is Dead'.	6, 4, 9, 10	12
5. Recreate a current debate (group debate)*	Preparation and participation in Oxford-type debate.	8, 3, 10	
6a. Final poster (group work)	Each group makes a poster on a theme relevant for SDG14. The team members will evaluate their own and each other's contribution towards the teamwork.	1, 4, 5, 6, 7, 8, 10	14
6b. Final paper (group work)	Each group makes a 3-page paper on a theme relevant for SDG14 (to support the poster). The team members will evaluate their own and each other's contribution towards the teamwork.	1, 4, 5, 6, 7, 8, 10	14
P1. Peer-review of your fellow's assignment on SDG14 trade-offs and conflicts	Write a peer review of your fellow student's analysis directly on the word document. Use comments and track changes (ca 300-500 words in total).	9	3
P2. Peer-review of your fellow's assignment on stakeholders	Write a peer review of your fellow student's analysis of stakeholders directly on the word document. Use comments and track changes (ca 300-500 words in total).	9	3
a. Network map of SDG interactions (group discussion, individual map)	Make a network map of the interactions (positive and negative) of all the 17 SDGs.	4	2
b. Participate in SDG Bergen Conference & reflect upon your experience (individual reflection)	Write a 300-word reflection of the activity you participated on.		2
c. Reflective short essay on changes in perception during the course (group discussion, individual essay)	First discussions in mixed groups on your perceptions on sustainability, SDG14, and your perceptions might have changed during this course. 300-500 words to be done "in class".	All	2

* In 2020 the assignment 5 was changed to an 'op-ed' article on an agreed theme due to the COVID-19 pandemic moving the teaching online.

Evaluation of team members' effort

Several of the assignments (2, 3, 5, and 6) in this course are done as teamwork in groups. The students are members of the same team throughout the semester, and these are set up to be as interdisciplinary as possible. All team members evaluate their own and their team members' efforts towards the group work, independently and anonymous to the other group members, and these evaluations influence the point sum each student receives for a given group assignment. The purpose of this effort evaluation is to hinder "free-riding" in the group assignments (e.g., Khuzwayo 2018). In case of large discrepancies in the perception of effort, the teacher discusses with the team members individually to clarify. The evaluations are usually surprisingly uniform, and the students within the group tend to agree on who did more work, or if the effort was equal. The goal is that the effort would be equally distributed among the team members, but occasionally some teams make it into a competition of who has the highest effort, which is not helpful as the scope of each assignment is limited. We have therefore paid special attention to teaching the students also how to work in groups and have found the resources available at University of British Columbia helpful[12].

Student feedback and the course development based on it

Student feedback is an essential part of course development process, particularly when including relevant questions. It is therefore great that out of the number of students who finished the course, 18 out of 18 students in 2019 and 30 out of 38 students in 2020 also filled the online feedback survey. The student feedback for the course has been, in general, positive: 85% and 93% of the students in 2019 and 2020, respectively, have been "in general happy with the course" (Figure 1). One concrete example of how student feedback has been useful for the course is the development of rubrics for the assignments. In 2019, just under a half of the students felt that the expectations for the assignments were clear, and over one third of the students felt they were not clear (Figure 2). In 2020, rubrics were developed for each assignment and, probably largely due to this, 97% of the students felt that the expectations were clear (Figure 2).

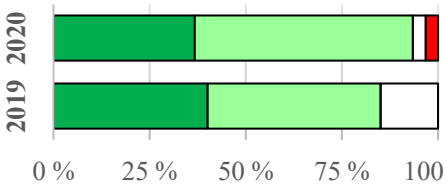

Figure 1: Statement: "I am in general happy with the course".

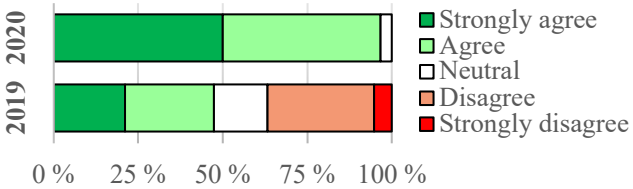

Figure 2: Statement: "Clear expectations were presented for the assignments".

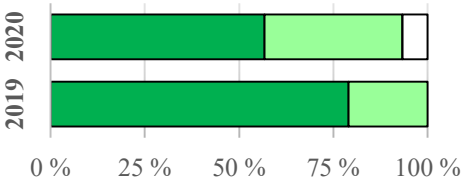

Figure 3: Statement: "The course developed my skills within critical thinking".

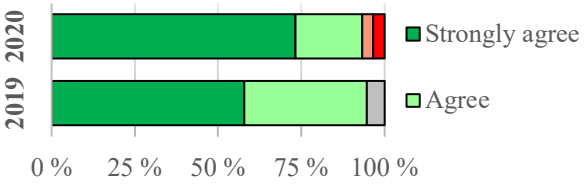

Figure 4: Statement: "The course developed my skills within cooperation".

12 https://learningcommons.ubc.ca/student-toolkits/working-in-groups/group-process/

The skills that most of the students feel were developed during the course are critical thinking (Figure 3), cooperation (Figure 4), and writing. In 2019, 95% of the students and in 2020, 90% of the students agreed that the course developed their skills in writing (figure not shown). The students also give free text feedback, and here are some selected examples highlighting what the students considered good with the course:

> *"Critical thinking was a big part of the course. This is something I haven't worked with that much throughout my years at college and therefore found it interesting to challenge myself"* – Anonymous student review.
>
> *"The working in groups was very interesting as well since we come from different fields of study and understand a bit better how it is at a UN table" – Anonymous student review.*
>
> *"I really enjoyed this course, and it makes me grow in ways beyond the subject itself by all the different tasks and assignments we have"* – Anonymous student review.
>
> *"Learning methods, all engaging and really encourage critical thinking and great discussions in class"* – Anonymous student review.
>
> *"The thorough feedback is a very positive thing, that one learns a lot from"* – Anonymous student review.
>
> *"Understanding the divergences the UN members meet and the science-public-opinion relation was very enlightening as well"* – Anonymous student review.

Conclusions

The SDG 214 course has turned out to be a course that interests a wide range of students. The students also experience improvement in the skills crucial for sustainable development, such as critical thinking and cooperation. The student feedback has been very helpful in developing this relatively new course. These positive experiences from the University of Bergen should encourage others to also set up courses centring around this, and other sustainable development goals.

The next challenge for this course is that we are currently limited by the capacity in our active learning rooms and the teaching staff - there are about twice as many students that want to take this course than there is capacity for, and we are therefore forced to start developing ways to upscale the active learning elements to a larger class size. For example, providing individual feedback as formative assessment is time-consuming, and we might need to consider new ways for providing feedback, by relying more on peer-feedback.

Ackowledgements

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Related material

In 2019 three short videos interviewing the students and teacher where made, available here: https://www.uib.no/en/sdgbergen/127497/connecting-student-active-learning-un-system.

The student posters and short papers from the course are openly available here: https://clichex.w.uib.no/category/sdg214/ .

References

Bevan, Samantha J., Chan Cecilia W. L., & Tanner Julia A. 2014. "Diverse Assessment and Active Student Engagement Sustain Deep Learning: A Comparative Study of Outcomes in Two Parallel Introductory Biochemistry Courses". *Biochemistry and Molecular Biology Education* 42(6): 474-479. DOI 10.1002/bmb.20824

Biggs, John. 1996. "Enhancing teaching through constructive alignment". *Higher Education* 32(3): 347-364. Netherlands: Kluwer Academic Publishers.

Boud, David, Cohen Ruth & Sampson Jane. 1999. "Peer learning and assessment". *Assessment & Evaluation in Higher Education* 24(4): 413–426.

Boulton-Lewis, Gillian M. 1995. The SOLO taxonomy as a Means of Shaping and Assessing Learning in Higher Education. *Higher Education Research and Development* 14(2): 143-154.

Bransford, John D., Brown, Ann L. & Cocking, Rodney R. 2000. *How people learn*. Washington, DC: National Academy Press. ISBN 0-309-07036-8.

Byrne, Jack. 2000. "From Policy to Practice: Creating Education for a Sustainable Future". In *Education for a Sustainable Future: A Paradigm of Hope for the 21st Century,* edited by Wheeler, Keith A. & Bijur Anne Perraca, 35-72. New York: Kluwer/Plenum.

Chickering, Arthur W. & Gamson, Zelda F. 1987. "Seven principles for good practice in undergraduate education". *American Association for Higher Education*: 3-7.

Cotton, Debby, & Winter Jennie. 2010. "It's not just bits of paper and light bulbs: A review of sustainability pedagogies and their potential for use in higher education". In *Sustainability education: Perspectives and practice across higher education*, 54-69. ISBN 9781849776516.

Freeman, Scott, Eddy Sarah L., McDonough Miles, Smith Michelle K., Okoroafor Nnadozie, Jordt Hannah, & Wenderoth Mary Pat. 2014. "Active learning increases student performance in science, engineering, and mathematics". *PNAS*, 111(23): 8410-8415.

Johnson, David W., Johnson Roger T. & Smith Karl A. 1998. "Cooperative Learning Returns To College What Evidence Is There That It Works?". *Change: The Magazine of Higher Learning* 30(4): 26-35.

Kearney, Sean. 2013. "Improving engagement: the use of 'Authentic self-and peer-assessment for learning' to enhance the student learning experience". *Assessment & Evaluation in Higher Education*, 38(7): 875-891.

Khuzwayo, Mamsi Ethel. 2018. "Assessment of group work in initial teacher education and training". *South African Journal of Education* 38(2): 1-11.

Nicol, David J. & Macfarlane-Dick Debra. 2006. "Formative assessment and self-regulated learning: a model and seven principles of good feedback practice". *Studies in Higher Education* 31(2): 199-218.

Prince, Michael. 2004. "Does Active Learning Work? A Review of the Research". *Journal of Engineering Education* 93(3): 223-231.

Rittel, Horst W.J. & Webber Melvin M., 1973. "Dilemmas in a general theory of planning". *Policy Sciences* 4: 155–169. Amsterdam: Elsevier Scientific Publishing Company.

Sadler, D. Royce. 1989. "Formative assessment and the design of instructional systems". *Instructional Science* 18: 119–144. Dordrecht: Kluwer Academic Publishers.

SDSN. "Accelerating Education for the SDGs in Universities: A guide for universities, colleges, and tertiary and higher education institutions". New York: Sustainable Development Solutions Network (SDSN), September 2020.

Shute, Valerie J., 2008. "Focus on Formative Feedback". *Review of Educational Research* 78(1): 153-189. DOI: 10.3102/0034654307313795.

Taras, Maddalena. 2005. "Assessment – Summative And Formative – Some Theoretical Reflections". *British Journal of Educational Studies* 53(4): 466-478.

Tilbury, Daniella. 2011. *Education for sustainable development: An expert review of processes and learning*. Paris: UNESCO.

UNESCO. "Education for Sustainable Development Goals: Learning Objectives". Paris: UNESCO, 2017. ISBN 978-92-3-100209-0.

UNESCO. "Issues and Trends in Education for Sustainable Development". Edited by Leicht A., Heiss, J. & Byun, W. J. Paris: UNESCO, 2018. ISBN 978-92-3-100244-1.

Wiek, Arnim, Withycombe Lauren & Redman Charles L., 2011. "Key competencies in sustainability: A reference framework for academic program development". *Sustainability Science* 6: 203–218. DOI 10.1007/s11625-011-0132-6.