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Examples of boundary crossing learning activities

This document shows a variety of possible learning activities you can implement in your course. Every activity is described in how it could be used in a course, including several alternative options (though certainly not exhaustive!), the boundaries that are crossed, and the BC learning mechanisms that are typically addressed via this learning activity. The examples are meant to inspire you to make these activities your own or think of new kinds of boundary crossing learning activities yourself.

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Link to BC/place on taxonomy
Learning Material – Identification, Learning Material – Coordination, Learning Material – Reflection, Learning Material - Transformation

Version
4-02-2020

Inspiration for boundary crossing learning activities

This document shows a variety of possible learning activities you can implement in your course. Every activity is described in how it could be used in a course, including several alternative options (though certainly not exhaustive!), the boundaries that are crossed, and the BC learning mechanisms that are typically addressed via this learning activity. The BC learning mechanisms referred to can be seen in the table below with abbreviations I-C-PM-T (*note: PM = perspective making and taking, which refers to the BC learning mechanism of Reflection. PM better shows what this learning mechanism is about*).

Goal of this document: This document is meant to give teachers inspiration for possible teaching and learning activities they can incorporate in their courses to stimulate Boundary Crossing.

- After the table with teaching activities, you can find a table with a lot of possible reflective questions addressing the BC learning mechanisms. Not exhaustive, also for inspiration.

Boundary Crossing Competence = the ability to ability to recognize, seek, appreciate and utilize the tensions arise when different perspectives and positions come together

The four Boundary Crossing Learning Mechanisms that help to utilize these tensions at the boundary: 1) Identification; 2) Coordination; 3) Reflection (also called "perspective making and taking"), and 4) Transformation

- Transformation can be addressed at the Product Level (co-creating a new idea, practice), but also at the personal level (= intra-personal Transformation; IntraT; this relates to a change in personal behaviour or identity)

	BC learning mechanisms (I-C-PM-T)
	See also: Gulikers, J., & Oonk, C. (2019). Towards a rubric for stimulating and evaluating sustainable learning. *Sustainability*, *11*(4), 969.
I1	**Identification 1:** Identify one's own expertise and one's own limitations
I2	**Identification 2:** Identify other perspectives relevant for the project and problem at hand
C1	**Coordination 1:** Contact other people
C2	**Coordination 2:** Collaborate purposefully with other people
PM1	**Perspective making and learning from each other 1:** (Re)consider perspectives
PM2	**Perspective making and learning from each other 2:** Learn from other people
PM3	**Perspective making and learning from each other 3:** Stimulate others to learn (general)
T1	**Transformation 1** (start/ product-related): Intend to develop a new, sustainable practice **Intra-personal transformation:** intend to change your (future) behavior due to gained insights and perspectives
T2	**Transformation 2** (process): Envision new practices during project process **Intra-personal transformation:** envision to work / approach things in differently as a person
T3	**Transformation 3** (product): Integrate various perspectives, interests or expertise in a final product **Intra-personal tranformation: i**ntegrate new perspectives or gained insights to redefine your (professional) identity
T4	**Transformation 4** (follow-up): Stimulate a follow-up on project results **Intra-personal transformation:** Stimulate further personal and professional development based on the current results/experiences

Title	Core of the activity	Boundaries addressed	Possible variation /addition	BC learning mechanism addressed
Debating different perspectives	Assign students roles of different stakeholders from who's viewpoint they participate in the debate	University society (different societal partners) Possibly different disciplinary perspectives	Let students prepare their own stakeholders' perspectives thoroughly with/without guiding questions	C2 PM1-2-3
Exploiting the group diversity in a poster market	Take a controversial topic relevant to the course (e.g animal welfare, palm oil; water conservation) Let student from different counties/cultures explicitly elaborate on the topic from their national & cultural perspective. Every student prepares a poster. In a postermarket session students share perspectives. After which intercultural groups develop a shared poster showing the topic from all different perspectives.	Cultural and international	Provide guiding questions to be addressed on the poster Let individual students elaborate their own poster with new insights gained from the other posters. Ask individual students to express (orally or verbally) how their own national/cultural perspective is challenged by the others: how is your own opinion on the topic changed?	I1 C2 PM1-2 Additional: IntraT
Optimising field visits and excursions	Offer students a list of critical questions to be asked to the societal stakeholder they visit to identify their perspective on a course relevant topic	University-society	**A.** Prepare: Let students first explicate their own perspective on the topic: What do they currently know about this issue? How do they feel about it? **B.** Prepare: Let students individually or in groups prepare a list of critical questions to ask the societal stakeholder to grasp their perspective **C.** afterwards: Let students visualise trade-offs between identified perspectives (including their own)	C2 PM1-2 Additional A. I1 B. I1 & PM1 C. I1 & possibly intraT
The interdisciplinary interview	Provide students with an authentic question relevant to the course addressed in one or more companies. Let students interview an employee on how (s)he uses different disciplines in dealing with this issue, also asking for added values and trade-offs between disciplines	Disciplines	A. Let students choose their own topic / company B. Invite alumni / guest to be interviewed explicitly from an interdisciplinary perspective C. before and/or after: let students before and/or after explicating (orally/verbally/ visually) their own perspective on the issue and map insights from different disciplines in their current perspective	C1 C2 PM1 Additional C. I1 & I2, (after: PM2 intraT)

				D. I1, I2, PM2, PM3, T3
			D. <u>after:</u> Let students draw a concept map of the identified different disciplinary insights, added values and trade-offs and mark their own perspective(s) in this map	
Interdisciplinarity in Thesis	Explicit assessment of interdisciplinarity in the (MSc) Thesis	Disciplines	A. Supervision by two different disciplines	PM1 T3 Possibilities for T2 and T4
			B. Thesis defence before two examiners from different disciplines	
			C. Adding a reflection on how students' personal perspective changed as a result having to integrate perspectives in the thesis.	<u>Additional</u>: I1, PM2, intraT
Boundary Crossing portfolio	Students reflect on their own experience and developments with regard to interdisciplinarity. They will create a portfolio with reflection papers written at X moments during the study programme. Students have to defend their reflection in a final interview. <u>Learning outcomes:</u> 1.assess technological, ethical, societal, and economic consequences of changes in the design of a biobased concept, product, or product process, and integrate these into scientific work within an interdisciplinary and international context. 2. Create additional value by combining biobased disciplines thus to apply an interdisciplinary approach	Disciplines Can be elaborated to contain also reflections on other boundaries	A. adding self/peer assessments using the BC rubric, possibly combined with personal learning goals and reflections on personal development	PM1, T2, T3 Possibilities for assessment talk: I1, PM2, intraT <u>Additional</u>: I1, I2, PM2, intraT
Let's organise a stakeholder meeting	Let students organise a stakeholder event on a course relevant authentic issue with a specific BC purpose like: a. Explicating different perspectives b. Collabora-tively identify new ideas c. Developing a boundary object to better understand each other d. Collabora-tively identifying boundaries in the issue and ways to cross these, taking into account different perspectives	University – society Possibilities for disciplines and cultures	Provide more or less structure in terms of kind of activity; kind or output; kind of questions to be addressed	C1, C2 Depending on purpose: a.I1, PM1, and possibly PM2/3 b. PM1, T2,, T3 possibly T1, T4 c. C2, PM1, PM3

				d. PM1-2-3, possibly T1-2-3-4
Developing a concept map using colour coding	Student groups collaboratively develop a concept map on a certain topic using colour coding: Step 1: individual concept map (blue pen) Step 2: elaborate 1 individual map with additions form other maps (red pen) Step 3: let students study the topic from a certain perspective (in books, articles, internet) Step 4: further elaborate the map with the theoretical insights (green pen)	Depending on the assigned perspectives in step 3.	A.Let students identify different disciplinary influences in their own perspective in step 1 B. let student draw an individual concept map afterwards, showing their (changed) own perspective	I1, C2, PM1, possibilities for PM2/3 Additional: A. I1 B. PM2, intraT, T1
The introvert and extravert Boundary Crosser	Boundary Crossing requires networking skills. Introverts and extraverts both have strengths and traps in this respect. Step 1: Let students fill in the introvert-extravert networking questionnaire Step 2: let students identify their own strengths and weaknesses as a BC-er/networker Step 3: let students review Table Y (see below) and reconsider their own strengths and weaknesses Step 4: make groups of extraverts and introverts to give each other tips from each other's perspective	Intraperso-nal boundaries		I1, PM2, PM3, intraT
The Concept Cartoon of Boundaries: seeing boundaries as learning opportunities	Aim is to let students view boundaries as learning opportunities	As many boundaries as possible		IntraT: towards seeing boundaries as learning opportuni-ties.
Exploiting daily news	Take a news article/video from a current relevant problem. Let students identify all different perspectives in the article (disciplines, but also entrepreneurs, governments etc) and then in groups define pro and con arguments for all of these groups.	At least societal boundaries (external stakeholder) Depending on the article/video	Let students explicate their own perspective (before) Let students identify changes / nuances in their own perspective after having done the assignment	I2 Depending on the additions also I1, PM1, PM2

		different disciplinary, cultural, and societal boundaries.	
Interdisciplinary case study including assessment rubric stressing interdisciplina- rity **(see Table Z)**	Interdisciplinary student teams work on a realistic case to be viewed from two different disciplines; innovative possible solutions to be developed and translated into advice for societal partner Assessment rubric available to assess different aspects from bridging disciplines	Disciplines University- society (a bit in providing advice for societal stakeholder)	I1, C2, PM1, T1-2-3-4

Table X. Interdisciplinarity section of MSc thesis Biobased sciences

	3. Interdisciplinarity (20%)					
3.1 Interdiscipli- nary report	No multidisciplinarity or interdisciplinarity in- cluded in thesis report	Multidisciplinarity but no interdisciplinarity in- cluded in thesis report	Report includes added value of interaction of at least 2 disciplines	Added value use of different disciplines discussed in report	Well described reflec- tion of added value of the combination of disciplines	Extended reflection of added value of the combination of disci- plines included in pro- ject and report
3.2 Interdiscipli- nary project	Only one discipline covered	More than one discipline covered but not com- bined	Project contains added value of interaction of at least 2 disciplines	Added value use of different disciplines addressed	Reflection on added value use of different disciplines	

Table Y. The introvert and extravert networker (Zack, 2010)

Introverts	Extraverts
Think to talk	Talk to think
Go deep	Go wide
Energize alone	Energize with others
Reflective	Verbal
Focused	Expansive
Self-reliant	Social
Network preferences	
Listening	Speaking
Calm	Activity
One-on-one	Groups
Networking strategies	
Pause (research)	Patter (discuss)
Process (focus)	Promote (self)
Pace (restore)	Party (socialize)

Table Z: Criteria in interdisciplinary assessment Rubric of Circular Economy

A dedicated assessment rubric has been developed for this course, based on rubrics for a practice oriented course, and techno-manegerially oriented course. Find the rubric in the appendix. The rows in the assessment rubric cover the cited learning outcomes, and align with the prescribed chapters. Proposed rows in the assessment rubric:

1. Presentation and description of assumptions and methodology in deploying LCA or ABM.
2. LCA or ABM specific analysis of the household waste management practices in Amsterdam, important cross-linkages between the disciplines (may be lengthy)
3. Develop options for better waste utilisation in line with circular economy principles (can be lengthy)
4. Develop, and prioritize scenarios on potential improvements for the household waste management in Amsterdam.
5. Advice the major of Amsterdam, by answering the main Research Question. Built it on the cross-linkages between different disciplines. (can be lengthy) Optional ABM: provide supported recommendations for the different districts
6. Looking back at the core method in your track and the topic of the course provide one major improvement for the LCA or ABM method.
7. Report lay out, that is document-like, thus including clear dedicated chapters, references, and optional appendices.

Examples of questions asked to reflect on BC learning activities
(the questions are aligned to the BC rubric (Gulikers, J., & Oonk, C. (2019). Towards a rubric for stimulating and evaluating sustainable learning. *Sustainability*, *11*(4), 969.)

This document contains a set of questions that can be posed to learners in a BC setting to trigger reflection on their BC learning.

The questions are categorized by (sub)learning mechanism and aligned with the BC Rubric (Gulikers, J., & Oonk, C. (2019). Towards a rubric for stimulating and evaluating sustainable learning. *Sustainability*, *11*(4), 969.). The lists of questions are illustrative, certainly not exhaustive.

NB Most questions are phrased for use in post-experience individual reflections, but can be re-phrased for use in pre-experience (e.g. expectation papers) and mid-term reflections and used for both individual and group reflections.

I1	**Identification 1:**

Identify one's own expertise and one's own limitations
 Which personal knowledge, skills, attitudes did you bring into the project/assignment/discussion?
- Which of your personal knowledge, skills, attitudes were key to the result of your project/assignment/discussion?
- Which personal knowledge, skills, attitudes did you personally lack to enable a useful contribution to the assignment at hand?
- Make an overview of knowledge, skills and attitudes that were needed to accomplish the assignment. Which of these did you personally possess?

I2	**Identification 2:**

Identify other perspectives relevant for the project and problem at hand
- Make an overview of knowledge, skills and attitudes needed to accomplish the assignment. Which of these did you personally bring into the project? Which of these were covered by your team members? Which of these had to be brought into the project from outside?
- Give an example of (1) complementarity of your and others knowledge, skills, attitudes for accomplishing the project and (2) annoying 'boundaries' between knowledge, skills and attitudes.
- Which stakeholders were key to the project? Why?
- To what extend have you been able to identify all relevant stakeholders at the beginning of the project? What made you miss some of them at the beginning?
- A network analysis includes an identification of stakeholders, their perspectives at hand and also their mutual relations. Did you manage to find out relationships between the stakeholders? To what extend was knowledge about the relationships between the stakeholders relevant to your project/assignment?
- Describe the advantages and disadvantages of working in a team with students from different disciplinary / cultural backgrounds. When answering this question, take both the process and outcome of your work in mind.
- Describe if you explicitly exchanged expectations amongst your team members/with stakeholders at the start of the project?
  - If yes, how did you organise expectation management? If you look back: has the mutual exchange of expectations influenced the process/collaboration/outcome? Why yes, why not?
  - If no: when looking back. Do you think having organised an explicit exchange of expectations at the beginning of the collaboration would have improved the process/collaboration/outcome? Why yes, why no?

C1	**Coordination 1:**

Contact other people
- When did you mobilise your identified stakeholders? Was this at the right moment? Why yes/no?

- Which communication channels did you use to contact external stakeholders? Make an overview and describe per channel a pro and a con of its use.
- What is, to your opinion, the most effective communication medium to get someone from outside the university on board of your project?
- In case you decided to call an external stakeholder, how did you prepare for the call? If you did not prepare yourself explicitly; what made the call run smoothly? What could have gone better and what would you do next time to make it a more purposeful chat?

C2   Coordination 2:

Collaborate purposefully with other people

- Describe which media/instruments you used to organise your internal/external collaboration
  - Which instruments/ways of working were key to effective collaboration?
- What was your biggest mistake (point to be improved) in terms of effective collaboration with your team mates / commissioners / external stakeholders / teachers; coaches?
- Instruments specifically designed to facilitate collaboration across practices are also called *boundary objects*. Did you specifically design a boundary object to facilitate the internal or external collaboration? If yes, how did the object look like? Did it indeed facilitate your cross-boundary collaboration? Which boundaries could more easily be crossed with the help of the boundary object? Which modifications would you suggest to the boundary crossing object to make it more useful?
- What do you regard as to be key to effective collaboration within a team and between your team and external stakeholders. Think of communication, planning, reporting etc. Do you think those key features are generally applicable to all kinds of collaborations or are they context specific? Why? Why not?

PM1   Perspective making and learning from each other 1:

(Re)consider perspectives

- What did you do to help others understand your perspectives; point of view; knowledge
- Turned this out to be effective? Why, why not? Illustrate with examples.

PM2   Perspective making and learning from each other 2:

Learn from other people

- List two or three main insights that you got from your collaboration with:
  - Fellow students with another disciplinary background
  - Fellow students from another culture/country
  - Fellow students showing a personal attitude that you did not master
  - The teacher/coach/supervisor
  - The commissioner
  - An expert invited to think along with you
  - An external stakeholder
- What made these insights key to your learning?
- Would you be able to use this learning insight into a new, similar project? Why, why not?
- What to do to be able to use the insight in a new setting?

PM3   Perspective making and learning from each other 3:

Stimulate others to learn

- Mention one example of you stimulating a peer/a stakeholder / the teacher to learn.
  - What do you think 'the other' learned from your intervention?
  - What do you think made the other learn? What did you do to stimulate the learning of the other? Describe in concrete behaviour; the way you asked questions for example.

T1   Transformation 1

(start)

Intend to develop a new, sustainable practice

- If you look back, did you intend/expect to create something new, innovative during the upcoming collaboration? Why? E.g. because of the multi-disciplinary nature of your team?

Because of the requirements of the assignment? Because of working with societal partners anyway?

- Please describe what made your intended practice new, innovative.

T2	**Transformation 2**

(process)

Envision new practices during project process

- What did you personally do to envision new, innovative practices during the project/assignment? Or, what did you personally do to stimulate your team to work towards something new and innovative?

T3	**Transformation 3**

(product; including personal transformation)

Integrate various perspectives, interests or expertise in a final product

- Describe why you think your final outcome is transformative, that is really new, innovative, and integrating perspectives and/or expertise into something new.
- What could have made your outcome more transformative? I.e. integrating more perspectives or various perspectives at a higher level?
- Do you regard yourself as to be transformed? Why? Why not? Illustrate your arguments with concrete examples of behaviour you show(ed) or did not (yet) show.
- What would be key aspects of your 'transformative' personal behaviour in case you would conduct a similar project in the future?

T4	**Transformation 4**

(follow-up; including further personal development)

Stimulate a follow-up on project results

- What did you do during or immediately after the project to stimulate a follow-up on the results of your project?
- Do you think your project and or ideas will be implemented? Why, why not? What are conditions for actual implementation?
- What would be your next action to ensure continuation of the transformative impact of your product; team? If the transformative output of your project was limited, what would support a more transformative output or process next time?
- What is required to continue developing your personal transformative capacities? Describe this as concrete as possible in terms of actual behaviour.

Examples of boundary crossing learning activities

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