Curriculum Making for Trito Learning: Wayfaring along a meshwork of systems thinking

David Ing + Susu Nousala
October 16, 2016
RSD5: Relating Systems Thinking & Design
Agenda

1. ST in Aalto CS 2010-2016

2. Trito Learning

3. Curriculum-making
The Master’s Programme in Creative Sustainability started in fall 2010 at the merger of 3 universities.

<table>
<thead>
<tr>
<th>120 credits</th>
<th>Master’s in Creative Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 to 10 credits compulsory</td>
<td>M.A. in Design (from legacy Taik)</td>
</tr>
<tr>
<td>32 credits compulsory</td>
<td></td>
</tr>
<tr>
<td>48 credits compulsory</td>
<td>M.Sc. in Business (from legacy HSE)</td>
</tr>
<tr>
<td>50 credits compulsory</td>
<td>M.Sc. In Engineering (either in architectural building design or in urban planning and design) (from legacy TKK)</td>
</tr>
<tr>
<td>40 credits compulsory</td>
<td>M.Sc. in Real Estate (from legacy TKK)</td>
</tr>
</tbody>
</table>
Two systems thinking courses launched in 2010-2011

SYSTEMS THINKING COURSES IN THE MASTER'S PROGRAMME ON CREATIVE SUSTAINABILITY AT AALTO UNIVERSITY: REFLECTIONS ON DESIGN AND DELIVERY OF THE 2010-2011 SESSIONS

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ABSTRACT

In fall 2010 and winter 2011, two new courses in systems thinking were initiated as core curriculum in the master’s programme in Creative Sustainability at Aalto University in Finland. As intensive courses, each was to be conducted as three full days of lectures over eight days, with students fulfilling credit hour requirements both independently and in group activities over a two-to-three month period. To complement the teaching staff at the university, a researcher active in the systems science community was brought in from abroad as a subject matter expert for the two courses.

In the summer preceding the first session, a reading list for the courses was drawn from current leading sources in the systems sciences, starting from 2010 and linking back to prior references of relevance. Lectures were prepared as minimal critical specifications, with concepts mapped into clusters of references, with the majority of sources available electronically over the Internet. On each set of the three lecture days, the courses were delivered in a face-to-face classroom setting, coupled with group activities designed in the style of Singerman inquiry sessions. Coordinating artifacts from the instructors evolved and were incrementally updated on a publicly-accessible web site, and students followed the social media style of posting their reflections on publicly-visible weblogs linked with notifications on an activity stream at a systems community hub.

Supplementing the chronological recollections of development and learning during the courses sessions, theoretical reflections constructed in hindsight may serve to inform the form and content of similar educational opportunities in other contexts.

Preparations are underway as the courses are being naturally evolved for a second cohort of students in fall 2011. The completion of one cycle of two courses presents an opportunity for reflections on the approach employed in the innovation/startup cycle, with
**2010/10 CS0004 Systemic Thinking of Sustainable Communities -- Course Outline**

This document is accessible (and may be updated) at [http://coevolving.com/aalto/201010-cs0004](http://coevolving.com/aalto/201010-cs0004).

- This is revision 1018a (as posted at October 18, 08:30 ET).

jump to: [Friday, October 1] [Monday, October 4] [Between sessions] [Friday, October 8] [Due November 1]

jump to: [Dilemmas] [Grading] [Tools]

jump to: References [Cluster 1] [Cluster 2] [Cluster 3] [Cluster 4] [Cluster 5] [Cluster 6] [Cluster 7]

Course instructors:

- Aija Staffans, aija.staffans@tkk.fi
- Katri-Liisa Pulkkinen, katri.pulkkinen@opendesign.fi
- David Ing, [http://coevolving.com](http://coevolving.com) and [http://syscoi.com/members/daving](http://syscoi.com/members/daving)

The course is listed as CS0004, with the code of SysTh Think Su C, as part of the Master's Degree program in Creative Sustainability at Aalto University. Sessions are scheduled as:

- 01.10.10, fri 10.00-16.00
- 04.10.10, mon 10.00-16.00
- 08.10.10, fri 10.00-16.00

From a systemic perspective, this course is seen as a complement to Systemic Thinking for Planners and Designers, CS0005, with the code of SysTh Think P D. While the core systems concepts between the two courses are compatible, the underlying philosophy, models and methods have different emphases.

**2011/02 CS0005 Systemic Thinking for Planners and Designers**

This document is accessible (and may be updated) at [http://coevolving.com/aalto/201102-cs0005](http://coevolving.com/aalto/201102-cs0005).

- This is revision 0210a (as posted at February 11, 01:00 CET).

jump to: [Pre-course Preparation] [Concurrent Studies] [Friday, February 4] [Tuesday, February 8] [Between sessions] [Friday, February 11] [Due March 14]

jump to: [Dialectics] [Grading] [Tools]

jump to: References [Cluster 1] [Cluster 2] [Cluster 3] [Cluster 4] [Cluster 5] [Cluster 6] [Cluster 7]

Course instructors:

- Aija Staffans, aija.staffans@tkk.fi
- Katri-Liisa Pulkkinen, katri.pulkkinen@opendesign.fi
- David Ing, [http://coevolving.com](http://coevolving.com) and [http://syscoi.com/members/daving](http://syscoi.com/members/daving)

This course is listed as CS0005, with the code of SysTh Think P D. Sessions are scheduled as:

- 04.02.11, fri 10.00-16.00
- 08.02.11, tues 10.00-16.00
- 11.02.11, fri 10.00-16.00

From a systemic perspective, this course is seen as a complement to Systemic Thinking of Sustainability Communities, CS0005, with the code of SysTh Think Su C. While the core systems concepts between the two courses are compatible, the underlying philosophy, models and methods have different emphases.

**Pre-course Preparation**
By 2015-2016, the structure of the curriculum had matured

1. Creative Teamwork
2. Creating the Mindset of Sustainable Societies
3. Systems Thinking 1
4. Systems Thinking 2
5. Continuous Transformation

2016/02 Systems Thinking 2 MUO-E8004 -- Index

The February 2016 session of CS0005 at Aalto University has its presentation materials available as open courseware, browsable at http://coevolving.com/aalto/201602-st2-muo-e8004/.

The key documents include:

| Map 00: Course Context | [as SVG] | [as PNG] |  ..  |
| Map 00: Foundations for a Systems Approach | [as SVG] | [as PNG] | reference cluster 0 |
| Map 01: Appreciative Systems, Futures | [as SVG] | [as PNG] | reference cluster 1 |
| Map 02: Boundary, Inquiry, Perspectives | [as SVG] | [as PNG] | reference cluster 2 |
| Map 03: Learning categories, postnormal science, ignorance | [as SVG] | [as PNG] | reference cluster 3 |
| Map 04: Dialogue, engagement, intervention | [as SVG] | [as PNG] | reference cluster 4 |
| Map 05: Ecosystems, collapse, resilience | [as SVG] | [as PNG] | reference cluster 5 |
| Map 06: Coevolution, turbulence, anticipatory systems | [as SVG] | [as PNG] | reference cluster 6 |
| Map 07: Living systems, viable systems, metabolism | [as SVG] | [as PNG] | reference cluster 7 |
| Map 08: Social-ecological systems, regime shifts | [as SVG] | [as PNG] | reference cluster 8 |

The maps were created with draw.io exported to SVG and PNG formats.

Aalto University, MUO-E8004 "Systems Thinking 2" (February 2016 course) by David Ing is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.
Student teams prepared 3 weeks to lead 8 dialectics in 6 days

2016/02 Systems Thinking 2 MUO-E8004 Course Outline

This document is accessible (and may be updated) at http://coevolving.com/aalto/201602-st2-muo-e8004/. The pages are listed in --index.html.

- This is revision 0117a (as posted at January 16, 21:00 ET). All maps 1 through 8 complete.

A more readable map is at http://coevolving.com/aalto/201602-st2-muo-e8004/201602-st2-muo-e8004-map09-context.png (or try the png version if SVG looks bad in your browser).

Set the style sheet for this page: None

jump to: Course orientation -- [Learning approach] [Grading]

jump to: Sessions -- [Tuesday, January 12] [January preparations] [Tuesday, February 2] [Friday, February 5] [Tuesday, February 9] [Friday, February 12] [Tuesday, February 16] [Friday, February 19] [Due: Appreciation Synthesis]

jump to: References -- [Cluster 0] [Cluster 1] [Cluster 2] [Cluster 3] [Cluster 4] [Cluster 5] [Cluster 6] [Cluster 7] [Cluster 8]

Course orientation

Course instruction team:

- Aija Staffans, aija.staffans@aalto.fi
- Susu Nousala, https://plus.google.com/u/0/11209323810678569723
- Glen Forde, glen.forde@aalto.fi

This course is a complement and continuation from Systems Thinking 1 (MUO-E8003). Since participation by all teams is required for the full 8 dialectics, each student team will prepare three 2-hour dialectics for the entire group of 8 dialectics. This document outlines the requirements and expectations for the preparation and delivery of the dialectics, as well as the course logistics and grading.

At the course orientation commencement on January 12, students will form groups. In 8 sessions, each of these groups will in turn lead a learning discussion by taking a collective position on the topic cluster. Members of two other groups will then challenge the presented position by probing on claims and questioning premises. A rich dialectic can serve to deepen understanding amongst all participants.

Individual students will write five appreciation diary logs, and a concluding appreciation synthesis, following an academic style of referencing.

Grading

Grades will be assigned in the following scheme:

- (1) Group discussion engagement, group position poster exhibition and class attendance: 60%
- (2) Individual appreciation diary logs: 15%
- (3) Individual appreciation synthesis: 25%

(1) Groups will each collaborate:

- (i) by preparing presentation materials (e.g. slides, maps, charts, models, exercises) including references to sources;
- (ii) as presenter-facilitators, sharing highlights from an assigned research reference cluster (for 45 to 60 minutes);
- (iii) as challengers, responding to presenters with lines of inquiry that will deepen learning (for 15 to 30 minutes); and
- (iv) by producing a concluding group position on the most salient system ideas from the course (not just the assigned research topic cluster) on exhibition posters for the last class meeting.

Groups should draw on their collective disciplinary backgrounds and experiences, and create highlights by extending their understanding of the research topic clusters. Extending the pattern language approach, the following framework may be helpful in structuring content:

- (a) Systems analysis of reference system
- (b) recognition of key systems elements
- (c) classification and sharing of patterns
- (d) integration and framing of patterns
- (e) summary and articulation of patterns

At the end of the dialectics, the group will produce a synthesis of the patterns identified, using a structured approach such as the Systems Thinking TETRA framework.
Concluding infographics of resonances were created in 72 hours

Eight infographics from “Systems Thinking 2” (2016)

Concluding 3 intensive weeks of content immersion, eight student groups created infographics of the ideas that resonated with them from the “Systems Thinking 2” class in the Creative Sustainability program at Aalto University. Each group had been given 3 weeks in advance to prepare content to lead a learning discussion, staking a position and asking for references. As students participated in the intensive sessions, the broader contexts reshaped those positions into a broader appreciation of the breadth of systems thinking. The positions and concluding syntheses were:

1. Appreciative systems, futures → Into the Future with Systems Thinking
2. Boundary, inquiry, perspectives → Systems thinking — synthesis
3. Learning categories, postnormal science, ignorance → Systems Thinking from learning and knowledge making perspective
4. Dialogue, engagement, intervention → Systems thinking from a dialogue perspective
5. Ecosystems, collapse, resilience → What is the purpose of understanding the differentiation between complexity and complicatedness in systems thinking
6. Coevolution, turbulence, anticipatory systems → Anticipatory systems, turbulence and coevolution
7. Living systems, viable systems, metabolism → How to make STEW (Systems Thinking Endless Wisdom)

The concluding infographics represent a synthesis of the content from the course, each group having traversed a different path. To rebalance team sizes, a few individuals shifted to a different group. Some anchored more on the content they had led, while others chose to strengthen linkages to other ideas.

2. Boundary, inquiry, perspectives → Systems thinking — synthesis

Group 2 worked through a cluster of references on boundary inquiry and perspectives and a map of the basic ideas to produce a presentation slide set.

3. Learning categories, postnormal science, ignorance → Systems Thinking from learning and knowledge making perspective

Group 3 focused on a cluster of references on learning categories, postnormal science and ignorance and a map of the basic ideas to produce a presentation slide set.
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1. ST in Aalto CS 2010-2016

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With known knowns in science eroding by systemic world changes, collective learning on why, how + when-where-whom gains value.

<table>
<thead>
<tr>
<th>Colloquial description:</th>
<th>Learning why</th>
<th>Learning how</th>
<th>Learning when, learning where, learning whom</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unknown Unknowns</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All the things you don't know you don't know</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Errors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All the things you think you know but don't</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Unknown Knowns</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All the things you don't know you know</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Taboos</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dangerous, polluting or forbidden knowledge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Denials</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All the things too painful to know, so you don't</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Pursuits:**
- Uncovering universal truths
- Instrumental rationality towards a conscious goal
- Values in practice based on judgement and experience

**Primary intellectual virtue:**
- **Episteme**
  - Science (viz. epistemology)
  - Analytic scientific knowledge
  - Research
  - Universal
  - Invariable (in time and space)
  - Context-independent

- **Techne**
  - Craft (viz. technique)
  - Technical knowledge
  - Production
  - Pragmatic
  - Variable (in time and space)
  - Context-dependent

- **Phronesis**
  - Prudence, common sense
  - Practical ethics
  - Action
  - Pragmatic
  - Variable (in time and space)
  - Context-dependent

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Trito Learning rolls with turbulent contexts by negotiating in worlds where proto-learning and deutero-learning break down

<table>
<thead>
<tr>
<th>Trito-learning (Learning 3)</th>
<th>Change in response correcting for contexts (i.e. systems of sets of alternatives)</th>
<th>Competing on tv cooking challenges as teams and individuals (e.g. Hell’s Kitchen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deutero-learning (Learning 2)</td>
<td>Change in response correcting the set of alternatives</td>
<td>Mastering a range of food prep traditions (e.g. Culinary Institute of America)</td>
</tr>
<tr>
<td>Proto-learning (Learning 1)</td>
<td>Change in response correcting errors within a set of alternatives</td>
<td>Training on food service handling for consistency and safety (e.g. cafeteria kitchens)</td>
</tr>
</tbody>
</table>


http://books.google.ca/books?id=Wfe2t_qzaHEC&pg=PA279.
To roll with the turbulence, T-shaped individuals collectively gain intelligence into T-shaped teams

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**Boundary-Crossing Competencies**

- Customer centricity, strategic thinking, operational excellence, people engagement, leveraging ICTs, and others
- Many disciplines/business functions
- Many systems/vertical industry expertise
- Many cultures/geographical experiences

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**Deep Knowledge**

- At least one discipline/business function
- At least one discipline/business function

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**Observation layer**

**From I-shaped to T-shaped knowledge, at layers of individuals and cooperating communities of practice**

<table>
<thead>
<tr>
<th>Perspective</th>
<th>← Motivations</th>
<th>Enabling factors</th>
<th>→ Expected benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual</strong></td>
<td>Empowerment</td>
<td>Self-image</td>
<td>Increased problem-solving and decision-making abilities</td>
</tr>
<tr>
<td></td>
<td>Personal success</td>
<td>Learning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Influence</td>
<td>Information variety</td>
<td></td>
</tr>
<tr>
<td><strong>Social entity</strong></td>
<td>Survival</td>
<td>Consonance</td>
<td>Resonance</td>
</tr>
<tr>
<td></td>
<td>Social identity achievement</td>
<td>Trust</td>
<td>Increased know-how and survival capability</td>
</tr>
<tr>
<td></td>
<td>Influence</td>
<td>Learning organization</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Relational capabilities</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Communication</td>
<td></td>
</tr>
</tbody>
</table>


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Ontogenetic development from the *transmission of representations* → the *education of attention* in ecological anthropology (Tim Ingold)

<table>
<thead>
<tr>
<th>Cognitive science</th>
<th>Phenomenological, ecological, practice-theoretic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge as information, human as devices for processing info</td>
<td>Knowledge as skills, humans aware and agency in a field of practice</td>
</tr>
<tr>
<td>Enculturation</td>
<td>Enskilment</td>
</tr>
<tr>
<td>Passing along information (e.g. writing out a recipe, from which an image in the mind forms as pattern)</td>
<td>Copying not other persons, but instead their actions (Merleau-Ponty) in guided rediscovery (e.g. showing someone how to crack an egg by taking their hand)</td>
</tr>
<tr>
<td>Innate dispositions (i.e. speaking, climbing, throwing), then receiving informational content</td>
<td>Perception as the activity of a whole organism in an environment, learning as fine-tuning or sensitisation of the entire perceptual system (Gibson)</td>
</tr>
<tr>
<td>Knowing as relations between structures in the world and structures in the mind</td>
<td>Knowing as immanent in life and consciousness of the knower as it unfolds within the field of practice (taskscape) with presence as being-in-the-world</td>
</tr>
</tbody>
</table>

Modality of travel from *transport* → *wayfaring* (Tim Ingold)

<table>
<thead>
<tr>
<th>Transport</th>
<th>→</th>
<th>Wayfaring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sailing <em>across</em> the surface of the globe (British)</td>
<td>→</td>
<td>Moving <em>along</em> paths of travel (Inuit)</td>
</tr>
<tr>
<td>Destination-oriented, of people and goods from location to location</td>
<td>→</td>
<td>Development- or process-oriented, no final destination, always somewhere further to go</td>
</tr>
<tr>
<td>Every port as a point of re-entry from temporary exile while in transit</td>
<td>→</td>
<td>Active engagement perceptually and materially, as the country opens up along the path</td>
</tr>
<tr>
<td>Moves to relocate people and their baggage</td>
<td>→</td>
<td>Lines that wend hither and thither, pausing here and there before moving on</td>
</tr>
<tr>
<td><em>In a maze</em> (i.e. a multicursal puzzle with many branches, paths and dead-ends) as intentional</td>
<td>→</td>
<td><em>In a labyrinth</em> (i.e. a unicursal puzzle with a single non-branching path) attentional in action</td>
</tr>
</tbody>
</table>

Interactions from *network* $\rightarrow$ *meshwork* (Tim Ingold)

<table>
<thead>
<tr>
<th>Network</th>
<th>Meshwork</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network of point-to-point connections</td>
<td>Meshwork of trails woven as lives go along them</td>
</tr>
<tr>
<td>Living within a perimeter</td>
<td>Living along lines (of flight, or of becoming)</td>
</tr>
<tr>
<td>Point of origin to another point (contiguous or distant)</td>
<td>Line of becoming with neither a beginning nor an end, only a middle</td>
</tr>
<tr>
<td>Impulse to reach a terminus</td>
<td>Impulse to keep going</td>
</tr>
<tr>
<td>Text (as verbal composition)</td>
<td>Texture (as a tissue of lines)</td>
</tr>
</tbody>
</table>

Enactment of education from *sequencing pedagogical content* → *curriculum-making* (Ross & Mannion)

<table>
<thead>
<tr>
<th>Sequencing pedagogical content</th>
<th>→ Curriculum-making</th>
</tr>
</thead>
<tbody>
<tr>
<td>Representing the world, with mental schemas</td>
<td>→ Living in the world, as dwelling in domains of entanglement</td>
</tr>
<tr>
<td>Textual understandings of curriculum</td>
<td>→ A process of living and through the world</td>
</tr>
<tr>
<td>Culture as socially constructed, invoking (i) a “real” nature, and (ii) a constructed representation</td>
<td>→ Immersion in a “dwelt-in” world, with active, practical and perceptual engagement</td>
</tr>
<tr>
<td>Planned activity and prescribed propositional knowledge</td>
<td>→ Living as an ongoing process of improvisation, in response to relations among people, places, material and activities</td>
</tr>
<tr>
<td>Shared representations of the world or experiences of the world</td>
<td>→ Shared environment of the communicators</td>
</tr>
</tbody>
</table>

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