Fostering student’s innovative capacity in undergraduate Building Technology Education (BTE).

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dr. M. Wolfensberger (lector Hanze)
Research Context & Relevance

- Critical to economic and societal success (McAlloone, 2007)
- Innovate capacity is a competence (Coakes & Smith, 2007)
- End qualification (HOG, 2015)
But no clear instructional programs...
Research question

The research aim
- to develop teaching-for-learning interventions that foster undergraduate students’ innovative capacity.

Overall research question
- what teaching-for-learning intervention(s) can improve students’ innovative capacity in undergraduate Building Technology Education?
## Work plan

<table>
<thead>
<tr>
<th>Past activities</th>
<th>Phase 1 Problem establishment</th>
<th>Phase 2&amp;3 Intervention design Experiment</th>
<th>End Phase Dissertation</th>
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<tbody>
<tr>
<td><strong>Sep.’14 – Dec. ’15</strong>&lt;br&gt;-Theoret. framework&lt;br&gt;-EBTE Profile research&lt;br&gt;-Focus group &amp; Delphi</td>
<td><strong>Sep.’15 – Sep. ’16</strong>&lt;br&gt;-Needs analysis&lt;br&gt;-Context analysis</td>
<td><strong>Nov. ’16 – Sep. ’18</strong>&lt;br&gt;-Developing &amp; testing&lt;br&gt;-Max. 3 design iterations&lt;br&gt;-Experimental test of effects</td>
<td><strong>Sep. ’18 – Sep. ’19</strong>&lt;br&gt;-Writing the dissertation&lt;br&gt;-PhD defence&lt;br&gt;-Dissemination</td>
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Main outcomes

• Better prepare students for careers
• Contribute to teachers’ professional development
• Provide empirical link between TL innovative capacity
The INNOVATION process includes:

PROBLEM SOLVING activities

INVENTION activities which are also:

IDEA GENERATION which involves:

CREATIVITY

DESIGN activities
Innovation Process

Innovation = Creativity + Implementation.

CPS Process

Creative problem-solving process. (Lumsdaine, 1999)
Creative problem solving framework and metaphorical mindsets superimposed on the Herrmann brain dominance instrument (HBDI) four-quadrant model (after Lumsdaine et al. 1999).
Teaching Innovation

4 major instructional strategies:

• User-centred approach
• Trans/multidisciplinary teams
• Project-based learning
• A practice supportive climate
Measuring Innovative Capacity

Our research will use 3 instruments:

• The youth innovation skills measurement tool (YISMT)
• Torrance Tests of Creative Thinking (TTCT)
• The Ideas Generation Implementation (IGI)
Levels of Innovation

## TL Activities & AT

<table>
<thead>
<tr>
<th>Teaching/learning activities</th>
<th>Idea finding objectives</th>
<th>Idea shaping objectives</th>
<th>Idea playing objectives</th>
<th>Idea refining objectives</th>
<th>Idea sharing objectives</th>
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</thead>
<tbody>
<tr>
<td>Curriculum objectives</td>
<td>• Observe</td>
<td>• Organize</td>
<td>• Combine (connect)</td>
<td>• Visualize</td>
<td>• Show</td>
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<tr>
<td></td>
<td>• Experience</td>
<td>• Simplify</td>
<td>• Associate</td>
<td>• Validate</td>
<td>• Demonstrate</td>
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<tr>
<td></td>
<td>• Inquire</td>
<td>• Clarify</td>
<td>• Reframe (restructure)</td>
<td>• Iterate</td>
<td>• Describe</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Widen</td>
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### Assessments task

**References:**
- (Biggs, 2003)
- (Amabile, 1996; Lumsdaine, 1999; Skaggs, West, & Wright, 2013).
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- (Antonietti, Colombo & Pizzigirilli, 2011; Skaggs, West, & Wright, 2013).
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## Overall setup

<table>
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<tr>
<th>Phase</th>
<th>Research Question (RQ)</th>
<th>Studies</th>
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| 1. Problem establishment      | **RQ1.** What aspects of innovativeness do Building Technology (BT) professionals consider relevant for the future BT engineering students?  
**RQ2.** To what degree are these aspects present in the curricula of the built environment education? | **Needs analysis (4 UAS)**  
- Focus group & Delphi  
- Questionnaires survey study  
**Errors analysis (4 UAS)**  
- TTCT (standardized test)  
- IGI (Assignment).  
- YISMT (questionnaire)  
- 2 Articles |
| 2. Intervention design study  | **RQ3.** What design criteria can be formulated for a teaching-for-learning intervention that stimulates students’ innovative capacity in BTE and how can this intervention be successfully implemented in practice? | **Developing & testing; design principles (needs & errors analysis = learning goals)**  
- Max. 3 Iterations  
- 1 Article |
| 3. Experimental study         | **RQ4.** What is the effect of the proposed teaching-for-learning intervention on students’ innovative capacity?                                           | - Preparing experimental setup  
- 1 Article |
Figure 4. Generic model for conducting educational design research (McKenney & Reeves, 2012)