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Innovative development of city spaces: a simulation for future engineers

Bridging the worlds of technology and social technology

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Overview

- Sustainable development: paradigms
- Engineering education at Group T: vision and curriculum
- Engineering Experiences
- Project work and collaborative skills
- Multiparty simulation
  - Objectives
  - Advantages
  - Organization
  - Debriefing and main learnings
- Conclusions

'Sustainable development': paradigms

Engineers

- Task dimension
- Problem solving process
- Cognitive and expert frame
- Multi-disciplinary: bring together different experts

Social scientists

- Relational dimension
- Interaction process
- Relational frame
- Reality is perspective based
- Beyond inter-disciplinary work: multi-actor collaboration

Engineering education at Group T: 'Beyond engineering'

- Engineering
- Enterprising
- Educating
- Environmenting
- Ensembling

GROEP T
LEUVEN HOGESCHOOL

BEYOND ENGINEERING

Curriculum

- Broader vision
  - 5-E's
- Technology fields
  - Matter, Energy, Information, Life
- Basic sciences
  - Chemistry, Physics, Mathematics, Biology
- In combination with
  - management and communication

Competencies based on requirements of organizations

"We don't need engineers. We need engineers driven by passion and eager to contribute to a sustainable future. People who believe in the power of new ideas, sharing, teamwork and relationships. Engineers who are more than engineers."

(job add, May 2009, Flemish newspaper)

"Madam, I came here for thermodynamics, not for group dynamics!"

(student, 1st bachelor)

"Once you are working other skills are more highly valued. I noticed, in particular the need for communication and social skills. Because of technological progress and the speed with which everything needs to be done, you are forced to work in a cross-functional way with other organizational structures and you can no longer refer to authority to win over your team members"

(ex student, Interview magazine 2007).

Course 'holistic engineering'

'whole system design' as

"a holistic approach to engineering that can help to achieve sustainable development enabling the decoupling of economic growth from environmental pressure. Engineers need to be aware of a new business model that enables companies to fully realize the transition to a sustainable, profitable, desirable future. In addition, however, engineers will also need to understand the personal and interpersonal obstacles associated with the change to this new societal model."

(course description, Serge Degheldere)

Declaration of Barcelona (2004)

An engineer *"(…) who has a long-term, systemic approach to decision making, one who is guided by ethics, justice, equality and solidarity, and has a holistic understanding that goes beyond his or her field of specialization"*.

'Engineering Experiences'

- Technological assignment
  - EE1: Creative engineering
  - EE2: Reverse engineering
- Learning focus
  1. Technology & science
  2. Structuring project work
  3. Collaborative skills
- Project and team based learninig
- Experiential learning

Educational approach

- Team work ➲ stimulate 'collaborative learning culture'
  - Working and learning simultaneously
  - Individual and collective learning
- Focus on skills more than on knowledge
- Responsibility for learning transfered to student
- Teacher is 'tutor' or 'coach'
- Reflection on past experience ➲ stimulate learning, problem solving and creativity
- Focus on *team* evaluation
  - Corrected by peer assessments (score for self and others), tutor score
  - Completed with feedback round

Project work and collaborative skills: 'group dynamics'

- Seminars to support team work
- Characteristics
  - Experiential learning approach: action and reflection
  - Transfer: explicit link between seminars and real life team work
  - 'Team exam'
    - 'Learning' = ability to link and integrate experiences (*practice*) with concepts and frameworks (*theory*)
    - Individual and collective preparation ➲ summary of learnings
    - Conversation of 45 minutes
    - Criterium: quality of team learning

Multiparty simulation as learning space - objectives

- Integrate group dynamic topics
  - Problem solving, dealing with differences,…
- Experience real life challenges of a 'holistic approach': problems embedded in wider context (sensitization)
  - Confrontation with: ambiguity, fragmentation, conflictual arena, unique and 'messy' situation
- Develop behavioural styles which foster common interests and collaborative skills
- Stimulate reflective capacity
  - Effects of behaviour, assumptions and attitudes
- Encourage 'holistic' learning

Advantages of using simulations

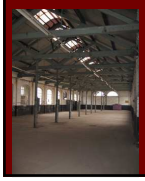
- Real life situation ➲ energy and committment
- Easy identification with interest parties
- Recognizable relationships with unequal power and a diversity of interests
- Bounded complexity in order to focus on essence: emergence of dynamics around the table
- Setting allows for spontaneous emergence of intra- and inter-group dynamics
- Confrontation with need to deal with critical issues
  - Leadership, individual and common interests, compromise or creativity, influence, power games, building trust, managing boundary spanners, …

Organization of the simulation

- 3 phases
  1. Experiential recognition
  2. Reflective recognition
  3. Residual recognition
- Simulation
  - Preparation
  - 3 rounds of meetings
  - In-between: consultation with constituency and bilateral contact
  - Debriefing








Interest parties

1. Autonomous Community Business 'Urban development' Leuven
2. Environmental department city of Leuven
3. Flemish Society for Social Housing
4. Architect group private housing
5. Neighborhood Committee
6. Cyclist Association Leuven
7. Commercial Association Leuven
8. Project developer

Debriefing: PPP model

Product: content and task

Process: relational aspects

Context

Procedure: structure, organization, roles

Main findings - 1

- **Product: task dimension**
  - Clarify assignment ➲ translate in common goal
  - Take expectations of commissioner into account
  - Express and explore different *and* common interests
  - Move from shared interests to creative solutions
  - Specify nature of the task and share critical information
  - Avoid quick decisions
  - Explore assumptions
- **Procedure: organization**
  - Clarify mandate of group
  - Establish clear roles of participants: e.g. moderator, representative, 'double hats'
  - Structure process: agenda, stress progress, visualize topics
  - Clarify procedures: e.g. decision making

Main findings - 2

- **Process: relationships**
  - Listen and check understanding; build on each other's ideas
  - Respect differences
  - Establish positive climate; win-win
  - Take time to build consensus
  - Respect power balance of parties
  - Develop a sense of 'we' among representatives
  - Avoid positioning and power games (win-lose)
- **Context: adaptation to environment**
  - Clarify expecations of commissioners
  - Negotiate clear mandate for respresentatives
  - Involve constituency
  - Take into account the interests of absent stakeholders

Conclusions

- Competency 'collaboration' - specific competencies
  - Setting up project work, managing yourself as team member, improving team effectiveness, organizing effective meetings, problem solving and decision making, working in multicultural teams, leadership of teams, innovation and creativity in multi-actor collaboration
- Role of teachers: from expert to coach
- Cultural preparation for foreign students