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Letter to the Editor

Strategic competencies, critically important for Sustainable Development

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A B S T R A C T

This paper emphasizes the importance of strategic competencies in education for Sustainable Development. Sustainable Development has been introduced in universities in many different forms. The adjective "Sustainable" has sometimes been added to educational and research activities that were only slightly modified. Integrating SD in education is regarded with mixed feelings. At the one hand academics are often convinced that their own discipline can render large contributions. At the other hand, SD is often perceived as an external interference in their discipline, and therefore as an attempt to make science subordinate to interests. So, if there is a political necessity to do SD, academics often prefer to introduce a separate Sustainable Development course (which can easily be abolished again). In the SD community there is often an opposite view. SD should be integrated in disciplinary courses in order to make a discipline really committed to SD. However, there is a fear of fake integration, or an integration that just depends on the commitment of a single individual. The resulting situation is that SD integration is often limited to some specific courses (depending on the lecturers) and that there is sometimes a specific SD course (optional or compulsory). This paper will first describe why integration is often preferred and then makes observations regarding SD integrated in courses. Afterwards it argues that strategic competencies are crucial for working towards SD, and that these competencies cannot be integrated in ordinary disciplinary courses. It provides some options to teach/develop these competencies.

1. Introduction

Sustainable Development has been introduced in academic education in many different forms (Segalas-Coral, 2009). New courses have been developed and the adjective "Sustainable" has been added to many educational and research activities that were often only slightly adapted.

Research and education contribute to SD by providing a better understanding of reality:

- Applied Science, economy and engineering are aiming at increased efficiency. They never aim for a decreased efficiency, so virtually all economic-, applied science- and engineering disciplines could call themselves "sustainable"?
- Medical research aims for improved quality of a longer life. Sustainable?
- Social sciences virtually always strive for increased participation, effective interaction and increased development especially of disadvantaged groups. Sustainable?
- Pure science, philosophy, arts and literature make us better understand mankind's place in the universe. They preserve and revive our cultural heritage. Sustainable?

In principle, many lecturers could add 'sustainable' to their course description, with only minor modification of its content, as their subject might indeed contribute to SD. The question is if such sustainabilizing of university education and research is sufficient. Do universities need no SD specialists anymore if SD has been successfully integrated in this way? Is it sufficient to address SD as an 'aspect' of a disciplinary subject (provided it has been done well)? This paper will argue that is not the case. Sustainable Development requires transitions. In order to contribute to transitions, major curriculum changes are required (Desha et al., 2009).

To contribute to SD, academics should be able to develop long term visions and deal with stakeholders that represent different values and different interests. Only by developing long term visions one can assess if options could have the potential to provide for our needs within the carrying capacity of the planet. Only by involving stakeholders, we can really claim to be able to take their needs in regard.

It is important that students acquire these strategic competencies themselves. Sustainable Development should be emancipatory, and should not be mistakenly perceived as one unique systemic vision of the world's future that only needs to be implemented by teaching our students the right instruments to achieve that goal (van Lente et al., 2003). Sustainable Developments is the outcome of reflection and social choice; mankind needs to design strategies, implement them, evaluate their effectiveness and side effects, account for the unforeseen, and design new strategies.

Many ordinary degree programs teach their students how to be effective in specific tasks. SD is regarded as setting the goal for that task. But the essence is that Sustainable Development always will

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remain a moving target. The main SD problems from 25 years ago (Ozone hole, Dying forests, hunger and malnutrition) have not been completely solved, but are certainly not anymore regarded as main threats. Therefore, students should not just be taught how to solve the problems of today, but also learn to develop strategies to handle new problems. Students should learn to analyze pathways that could lead to (partial) solutions of these new problems, to recognize relevant stakeholders, and how they could become involved: Sustainable Development requires above anything else the capacity of strategic thinking!

This paper provides a number of examples that show how strategic competencies might be developed by students. However, it should be acknowledged that direct action, i.e. really contributing to create something in reality, is motivating for students. Combinations of teaching methods and knowledge that can directly be applied (motivating but less effective) and teaching strategic reflections on pathways to long term SD and its impacts (that is less motivating) might stimulate student motivation as well as enable them to target their actions better at long term goals.

2. Integrating SD in courses, why and how

There are many pleas for integrating SD into disciplinary courses. Arguments for the integration are often only given implicitly. One main reason is pretty down to earth, but still quite important: to prevent threatening the interests of the existing teaching staff. Teaching SD will not threaten their position.

But apart from this reason, there are more fundamental reasons to prefer integration of SD into the courses of a curriculum, instead of using an add-on approach. One of the basic disadvantages of the add-on approach is that such an add-on course remains a “foreign body” in the curriculum. Students tend to forget the knowledge of the course, as it does not build on previous courses, and none of the follow up courses is referring to the SD course. Moreover, the course can easily be abolished again, without any adaptation of the curriculum, and be replaced by anything else. So SD integration into existing courses both contributes to the learning effect, as the subject repeatedly returns, and to the ‘sustainability’ of SD teaching within the curriculum. For example, there are a great number of courses at TU Delft that have integrated SD (issues), see Box 1 and 2.

Naturally, recent pleas for integral Sustainable Design (deKay and Bennett, 2011) should not be mixed up with the issue of SD integration in the curriculum: being able to integrate various types of knowledge does not imply that all this knowledge needs to be taught in integrated courses! Sterling (Sterling, 2004) states: ”If engineers are to contribute truly to sustainable development, then sustainability must become part of their everyday thinking. This, on the other hand, can only be achieved if sustainable development becomes an integral part of engineering education.” This last sentence is doubtful: math’s are often taught in separate courses and still are part of everyday engineering practice. However, math’s are often used in other engineering courses. So why couldn’t there be a specific SD course which would be input material for other courses? There is no compelling reason why SD should not be taught in a separate course in the curriculum, if this course would be well integrated into the curriculum. On the contrary, if SD is an integrated element of all other courses in a curriculum, i.e. a meta context for the curriculum (Segalàs and Tejedor, 2012), then where is this meta context and its key concepts taught (problem analysis, systems thinking, interrelationship technology-environment-society, futures strategies & innovation)?

Having a separate SD course and integration of SD elements in disciplinary courses is only a phase in developing a real SD targeted curriculum. The next and final phase should be the creation of a new curriculum from an SD perspective: not taking the discipline as starting point to add SD to, but starting from the necessity for the discipline to make contributions to SD, and develop a curriculum for that aim (Sterling, 2004). Depending on the discipline, various SD elements could perhaps be integrated in other courses. Students can be, and in fact sometimes are, informed how solutions (like specific new technologies) fit into government or company strategies (Segalàs i Coral et al., 2012). However, this is quite different from being able to develop a strategy. For many

Sustainability integrated courses at TU Delft

Analysis and technology
EMC-A/EI-00 Environmental Issues (2)
AE3W02TU Introduction to Wind Energy (3)
AE4T40 Kite, Smart Kites, Control and Energy Production (3)
AE4W09 Wind Turbine Design (3)
AE4W20 Wind power (3)
AES1470 Geothermics (2)
AP3141 Environmental Physics (6)
AR0084 Sustainable Design, Time Based (10)
AR0190 Urban Sustainability (2)
AR0531 Smart & Bio Climatic Design (6)
AR0532 Smart & Bio Climatic Design Theory (3)
AR0891 Smart Architecture (7)
AR1U130 Sustainable Urban Engineering of Territory (4)
AR2AE035-Building Design & Engineering/Climate Design (3)
AR2AE045 Building Design & Engineering Seminars (2)
AR2A015 Delft Lectures on Architectural Sustainability (3)
AR3B320 Green Building Innovation (5)
CT3360 Subsurface Management (4)
CT3420 Sanitary Engineering (4)
CIE4100 Materials and ecological engineering (4)
CIE4450 Integrated Water Management (4)
CIE5304 Waterpower Engineering (3)
CIE5420 Public Hygiene and Epidemiology (3)
CIE5460 Ecology in Water Management (3)
CT5531 Waste Water Treatment 2 (4)
CIE5560 Civil Engineering in Developing Countries (4)
CIE5720 Environmental Impact Assessment (3)
ET4149 Solar Cells (4)
ID4175 Advanced Embodiment Design (2)
ID5356 Sustainable Design Strategies for Product Development (3)
ID5561 Product-Service Systems (3)
ID5600SET Smart Energy Products (4)
IO3835 Sustainable Mobility and Vehicle Design (3)
LM3142 Environmental Biotechnology (3)
LM3311 Green Chemistry and Sustainable Technology (3)
ME1400 Sustainability in Transportation Engineering (3)
OE5662 Offshore Wind Farm Design (1)
4413DOSTSY Design of Sustainable Technological Systems (6)
4413RENESY Renewable Energy Systems (6)
4413UEINFY Urban Environment and Infrastructures (6)
SPM5610 Planning and Design of Multi-Modal Infrastructure Networks (5)
SPM9448/9445 Methods for risk analysis and management (5)
SPM9447 Design of safety and security systems (6)
SPM9506 Fuel Cells (3)
SPM9750 Environmental Sustainability in the Built Environment (4)
WB4438-11 Technology and Sustainability (3)
WB5431-05 Life Cycle Engineering (3)
WM0804TU Project Safety Science (6)