TAMPERE UNIVERSITY
OF APPLIED SCIENCES

EDUCATION FOR SUSTAINABLE DEVELOPMENT AT TAMK

A Look at Four Degree Programmes

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ABSTRACT

Tampereen ammattikorkeakoulu
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PAAVOLA, MARTTA:
Education for Sustainable Development at TAMK
A Look at Four Degree Programmes

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The aim of this thesis was to map the implementation of education for sustainable development (ESD) at Tampere University of Applied Sciences (TAMK). ESD aims to provide students with the skills and the motivation to tackle local and global sustainability challenges and to become active shapers of a better future. It should not only be education about sustainability topics, but, by being learner-centred, interactive and exploratory, to impart the knowledge and competencies for concrete actions towards achieving sustainability.

Four degree programmes were studied for this thesis: Building Services Engineering, Mechanical Engineering, Energy and Environmental Engineering, and Hospitality Management. Teachers from these four programmes were invited to take part in semi-structured group interviews, and some supporting information was gathered by reading through the curricula of the programmes for any course descriptions with content related to sustainable development. The interview questions delved into the types of sustainable development topics the interviewees' courses cover, the teaching methods they employ, and the learning outcomes they expect from their students.

The results indicate that themes related to sustainable development are present in much of the teaching in the four programmes, but they are not often associated with the concept of sustainability. Some of the pedagogies called for by ESD, such as collaborative learning and co-operation with companies and organisations outside of TAMK, have a strong presence in the four programmes. The interviewees also asserted that they encourage the use of other core competencies of ESD, such as critical thinking and systems thinking skills. Other essential components of ESD, such as interdisciplinarity, were not included to their full potential.

ESD calls for its values to be made explicit. Based on the findings of this thesis, it would be recommendable to make sustainable development a more visible part of teaching activities in TAMK. Since this thesis only reviewed four study programmes, there remains much additional work to be done to get a comprehensive picture of the implementation of ESD at TAMK.

Key words: education for sustainable development, higher education, sustainable development

TIIVISTELMÄ

Tampereen ammattikorkeakoulu
Degree Programme in Environmental Engineering

PAAVOLA, MARTTA:
Kestävän kehityksen opetuksen toteutus TAMKissa
Katsaus neljään koulutusohjelmaan

Opinnäytetyö 58 sivua, joista liitteitä 1 sivua
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Opinnäytetyön tarkoituksena oli kartoittaa, kuinka kestävän kehityksen opetusta (keke-opetusta) toteutetaan Tampereen ammattikorkeakoulussa (TAMK). Keke-opetus pyrkii tarjoamaan opiskelijoille taidot sekä motivaation paikallisten ja maailmanlaajuisten kestävän kehityksen haasteiden ratkomiseen. Sen tarkoituksena on luoda aktiivisia kansalaisia, jotka ovat halukkaita luomaan parempaa tulevaisuutta. Keke-opetuksen ei tulisi olla ainoastaan kestävän kehityksen aiheita teoreettisella tasolla käsittelevää, vaan oppijalähtöisenä, interaktiivisena ja tutkivana sen tulisi antaa opiskelijoille tarvittava tietämys ja pätevyys, jotta he pystyisivät konkreettisiin tekoihin kestävän kehityksen tavoitteiden saavuttamiseksi.

Opinnäytetyötä varten valittiin talotekniikan, konetekniikan, Energy and Environmental Engineeringin ja palveluliiketoiminnan koulutusohjelmat. Opettajia näistä neljästä koulutusohjelmasta pyydettiin osallistumaan puolistrukturoituihin ryhmähaastatteluihin, ja lisäksi koulutusohjelmien opinto-oppaista etsittiin kestävään kehitykseen liittyviä kurssikuvauksia. Haastattelukysymyksissä paneuduttiin siihen, minkälaisia kestävän kehityksen aiheita haasteltavien kursseilla käydään läpi, minkälaisia oppimismetodeja he käyttävät ja minkälaisia oppimistuloksia he odottavat opiskelijoiltaan.

Tulokset osoittavat, että kestävän kehityksen teemoja on näiden neljän koulutusohjelman opetuksessa paljonkin, mutta niitä ei yleensä liitetä kestävän kehityksen käsitteeseen. Jotkut keke-opetuksen edellyttämät opetusmetodit, kuten yhteisöllinen oppiminen ja yhteistyö TAMKin ulkopuolisten yritysten ja yhdistysten kanssa, ovat vahvasti läsnä. Haastateltavat myös kertoivat kannustavansa opiskelijoita harjoittamaan keke-opetuksen keskeisiä kompetensseja, kuten kriittistä sekä systemaattista ajattelua. Toisia keke-opetuksen olennaisia osia, kuten tieteidenvälisyyttä, ei käytetty hyväksi niin täysin kuin olisi mahdollista.

Keke-opetus edellyttää, että sen arvopohja tuodaan selkeästi esiin. Tämän opinnäytetyön tuloksien perustella olisi suositeltavaa tehdä kestävästä kehityksestä näkyvämpi osa TAMKin opetustoimintaa. Koska tämä opinnäytetyö tutki vain neljää koulutusohjelmaa, paljon lisätyötä vaaditaan kokonaisvaltaisen kuvan saamiseksi keke-opetuksen tilasta TAMKissa.

Asiasanat: kestävän kehityksen opetus, korkeakouluopetus, kestävä kehitys

CONTENTS

ABBREVIATIONS AND TERMS

BSE	Building Services Engineering
DESD	UN Decade for Education for Sustainable Development, 2005-2014
EEE	Energy and Environmental Engineering
ESD	Education for sustainable development
ESDAN	Education for Sustainable Development in Academia in the Nordic countries project
GAP	Global Action Programme on education for sustainable development
HEI	Higher education institution
HM	Hospitality Management
ME	Mechanical Engineering
TAMK	Tampere University of Applied Sciences
TUT	Tampere University of Technology
UNESCO	United Nations Educational, Scientific, and Cultural Organisation
UTA	University of Tampere

1 INTRODUCTION

The purpose of the thesis was to determine how sustainable development is taught at the Tampere University of Applied Sciences (TAMK), whether explicitly (by discussing the term itself and the multitude of topics falling under its wide umbrella) or implicitly (by imparting lessons in sustainability without naming it as such). As an inseparable part of education for sustainable development, this thesis further explored how the various pedagogical approaches essential in education for sustainable development are implemented in the teaching activities at TAMK. Four degree programmes were examined, Building Services Engineering, Mechanical Engineering, Energy and Environmental Engineering and Hospitality Management, by interviewing teachers in these programmes as well as going through the curricula of the programmes to find any sustainability-related wording in the course descriptions.

Finland has one of the most highly educated populations in the world, with 85% of the adult population having graduated an upper secondary educational institution, and 38% having completed tertiary education in 2013. The quality of education is similarly one of the best, with Finnish students consistently being the top performers in the Programme for International Student Assessment (PISA) in the areas of language, mathematics and science skills. (OECD Better Life Index n.d.)

At the same time, the ecological footprint of Finland was the 15th largest in the world in 2012. The ecological footprint measures the consumption of natural resources and the generation of waste against the Earth's capacity to generate new resources and to absorb the waste produced. Earth's biocapacity per person is currently 1.7 global hectares, but Finland's ecological footprint per capita was 5.9 global hectares, which means that every Finnish person used up resources at some 3.5 times the Earth's regenerative capacities. (Global Footprint Network 2016.)

McKeown et al. (2006) draw attention to this paradox between education and resource consumption. Increased rates of education among the female portion of any population will cut down fertility rates, curbing overpopulation and reducing overall resource consumption. Meanwhile, growing education levels will cause a simultaneous growth in incomes, which is directly correlated to resource use: the rich of the world consume significantly more than the poor. (McKeown, Hopkins, Rizzi & Chrystalbridge 2006, 12.)

Above Finland in the ecological footprint ratings are other rich and highly educated countries such as Australia, Sweden, the United States, and Canada. And at the bottom of the list, with the smallest footprints, are countries rife with extreme poverty, such as Malawi, Burundi and Eritrea. (Global Footprint Network 2016.)

It is clear, then, that high levels of education and ecological sustainability do not go hand in hand. Along the same lines, Martin and Jucker (2003) note that the world leaders failing to rise up to the challenges of sustainability in the world today are, for the most part, highly educated individuals. They go on to pose some difficult questions:

> Why is the illiteracy amongst the world's politicians about how the world works as a living system, so widespread? Why is it so rare that we encounter in our leaders the qualities needed to enable sustainability: humility, respect for all forms of life and future generations, precaution and wisdom, the capacity to think systemically and challenge unethical actions? (Martin and Jucker 2003, 3.)

As the shapers of tomorrow's leaders, directors, and decision-makers, universities have a responsibility to foster the skills and awareness for achieving a sustainable future. This applies to graduates of all disciplines, whether engineers, teachers, politicians. Additionally, universities are viewed as the hubs of higher knowledge in society, and hence they should, through teaching and institutional practice, act as role models in implementing best practice for the future. New career paths are opening up, demanding graduates with a wide range of interdisciplinary competencies in sustainable development and strong problem-solving skills. (Martin & Jucker 2003, 4.)

2 SUSTAINABLE DEVELOPMENT AS A CONCEPT

The concept of sustainable development saw its beginnings in 1972, at the UN Conference on the Human Environment in Stockholm, Sweden, where for the first time sustainability received a global scope. The conference gave considerations of sustainability an impetus, leading to the formation of several environmental protection agencies and committees, among them the World Commission on Environment and Development (WCED), also known as the Brundtland Commission, in 1983. (Drexhage & Murphy 2010, 7–8.) Four years later they produced *Our Common Future*, a report which first defined the term "sustainable development" as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987).

Our Common Future gave the term political recognition, the Brundtland Commission's definition being widely cited even to this day, and it was solidified at the UN Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, in 1992, also known as the Earth Summit or the Rio Summit. (Drexhage & Murphy 2010, 8.) As a result of the Earth Summit, the Agenda 21 programme was published, which was the first concrete action plan for advancing sustainable development, giving it internationally recognised goals. (Rohweder 2008, 18.)

In these early days of the term's formation, the emphasis was on environmental issues. In the 1980s there was an increase in the public awareness of evolving environmental emergencies, such as the hole in the ozone layer as well as the first signs of growing global temperatures. Disasters such as the Chernobyl nuclear accident in Ukraine and the Exxon Valdez oil spill in Alaska served to heighten concerns over the state of the natural environment. A significant change in the direction of sustainable development's interpretation occurred during the Rio +10 Summit in Johannesburg, South Africa, in 2002. The perspective shifted from stressing the relationship between environment and economic activities to merging social and cultural aspects into an equally important part of the whole. This change was perhaps a natural one, as the turn of the millennium had seen growing consciousness of the social and economic effects of and the inequity caused by globalisation. The explosive growth of information technology had made it possible to get real-time news of armed conflicts, poverty, famine and terrorism from anywhere around the world. Ordinary consumers had become more and more interested in issues such as the

origins of the products they buy, what type of working conditions they have been produced in, and the effects they have on the environment. (Rohweder 2008, 18–19.)

The term “sustainable development” has, then, gone through numerous revisions since its inception. There still is debate into its exact meaning, leading to dozens of divergent interpretations, but some central principles are generally accepted. First, equity and fairness are paramount, meaning improving the quality of life of the world’s poorest and considering the rights of future generations with every action taken should be first concerns. Second, a long-term view should be adapted, in accordance to the precautionary principle, as enjoined by the Rio Declaration on Environment and Development (a product of the Rio Summit, alongside Agenda 21), which holds that counteracting serious environmental degradation should not be delayed only due to a lack of full scientific certainty. Third, sustainable development encompasses three functional dimensions: the environmental, the social, and the economic. These three are seen as interconnected and cannot be separated; neither is the purpose to play one issue off the other, but rather to think of them holistically, as a part of a whole. (Drexhage & Murphy 2010, 6.)

Economist Jeffrey D. Sachs (2015) expounds on this last point by discussing the ever-growing world population and how people of all socio-economic statuses wish to improve their standards of living. In this rapid expansion of the world economy the distribution of wealth is highly unequal between and within countries, with the richest 20% of the global population consuming 80% of the world’s natural resources. This creates a remarkable contrast: the richest enjoy longevity, health and well-being unprecedented in world history, while the poorest struggle to gain access to the basics of survival, such as food, water, and sanitation. Furthermore, the growing economy puts immense pressure on the global environment by propagating climate change, threatening biodiversity, and disrupting natural processes such as the water, nitrogen and carbon cycles. (Sachs 2015, 1–2.) The wanton use of natural resources has left their supplies at the point of collapse, either in quantity (such as oil reserves) or in quality (such as pollution in water or air) (Drexhage & Murphy 2010, 6).

Sustainable development is both an intellectual undertaking, attempting to understand the interconnections of the three intricate systems of environment, society and economy, as well as a normative vision, setting goals to attain a desirable world. As the sustainable development framework is holistic, it is sometimes said that sustainable development goals work to realise “socially inclusive and environmentally sustainable economic

growth" (Sachs 2015, 3). Here a difference between "sustainable development" and "sustainability" can be drawn: sustainability is the state the ideal world exists in, while sustainable development encompasses the numerous actions taken and goals established in order to achieve sustainability. (UNESCO 2016.)

A set of just such goals, seventeen in all, is outlined in the 2030 Agenda for Sustainable Development, adopted by the UN General Assembly in 2015. The Agenda contains 17 goals and 169 targets, which include an array of issues such as ensuring food, water and energy security for all, achieving gender equality, and promoting sustainable economic growth and industrialisation. However, poverty eradication is named as the foremost priority, identifying it as the one "greatest global challenge" and a prerequisite for sustainable development as a whole. (Transforming Our World… 2015.)

This leads to the problem at the heart of the concept of sustainable development: how to ensure economic growth to alleviate poverty without placing any more undue stress on the natural environment? Already major developing countries are on the path to gaining the same level of prosperity with developed countries, with the proportion of people who live by less than $1 per day having declined by half between 1981 and 2001 (most of this development has been happening in Asia, while in Sub-Saharan Africa the number of people living in extreme poverty has grown). At the same time, few developed countries are willing to lead the way into choosing more sustainable modes of living. As the Global Footprint Network's findings attest, global resource consumption is increasing at a rate that is beyond Earth's regenerative abilities. (Matthew & Hammill 2009, 1118, 1121.)

Sustainable development goals have been adapted as a guiding principle by many organisations, governments and businesses around the world, but their practical implementation has been lacking. (Drexhage & Murphy 2010, 9.) Matthew and Hammill (2009) ascribe this to a number of factors, among which are the political and bureaucratic barriers. Implicit in the "development" part of sustainable development is the idea of change; yet in all institutions and societies there are people who benefit from the status quo. Even when they recognise that the present situation is imperfect, the consequences of a change can be unpredictable, and thus bringing it about can be deemed too risky. Another political impediment results from a lack of unequivocally trusted global leadership in matters of sustainable development. (Matthew & Hammill 2009, 1121.) It is clear, then, that more profound ways of motivating new generations to take actions towards sustainability are required.

3 EDUCATION FOR SUSTAINABLE DEVELOPMENT

3.1 Basic tenets of education for sustainable development

To attain the kind of world that sustainable development strives towards – "a more just, peaceful, tolerant, inclusive, secure and sustainable world" (UNESCO 2014, 12) – a fundamental change in thinking and in actions is needed. Education for sustainable development (ESD) has been proposed as a way to instil in individuals the values, skills and knowledge required to enacting a positive societal change and a more sustainable future (UNESCO 2014, 8).

United Nations initially called attention to education's central role in addressing the challenge of sustainable development in the Agenda 21 programme, created following the UN Conference on Environment and Development in Rio de Janeiro in 1992. Ten years later in 2002, at the Rio +10 Summit in Johannesburg, South Africa, the years between 2005 and 2014 were declared as the UN Decade of Education for Sustainable Development (DESD), and the United Nations Educational, Scientific and Cultural Organisation (UNESCO) was tasked to act as the leading international agency in promoting and developing ESD during this time. An implementation plan was drafted as a framework for UN partners to base their actions on. (UNESCO 2005, 8.) During the 2012 UN Conference for Sustainable Development, Rio +20, UN Member States made commitments to maintain the promotion of ESD even beyond the year 2014. As a follow-up for the DESD, UNESCO developed the Global Action Programme (GAP). (UNESCO 2014, 3.)

The DESD implementation plan and the GAP both drafted and built upon a widely shared framework of ESD. The GAP divides ESD into four components: 1) learning content, i.e. making critical sustainability issues a part of curricula, 2) pedagogy and learning environments, i.e. adapting interactive, learner-centred and exploratory approaches, 3) learning outcomes, i.e. teaching critical and systemic thinking, problem-solving skills, collaboration in decision making, and instilling a sense of responsibility for the world at present as well as in the future and, ultimately, 4) a societal transformation, by empowering learners to become drivers of change. (UNESCO 2014, 12.)

Regarding the first component, learning content, Wyness and Sterling (2015, 240) aver that there is no mandate for topics that have to unquestionably be included in any specific

curriculum geared towards sustainability; rather, any from a number of themes can be adopted according to their relevance in each disciplinary area, then used to open up the way to the broader themes of sustainability. Some such topics are shown in table 1.

TABLE 1. Course content stemming from the various dimensions of sustainability (Wyness & Sterling 2015, 241).

Environmental sustainability	Economic sustainability	Social sustainability
Natural resources management	Alternative futures	Sustainable communities
Food and farming	Leadership and change	Cultural diversity
Ecological systems	Learning organisations	Intercultural understanding
Waste/Water/Energy	Corporate social responsibility	Sustainability in the built environment
Biodiversity	Consumerism and trade	Travel, transport and mobility
Climate change	Globalisation	Health and well-being
	Accountability and ethics	Peace, security and conflict
	International development	Citizenship, governance, democracy
	Sustainable and ethical tourism	Human rights and needs
	Population	
	Social enterprise	

The second and third components have received much attention in the form of framing specific pedagogical approaches, as essential to successful implementation of ESD as the contents themselves. The central idea is that ESD should not only comprise education *about* sustainable development, which consists of theoretical discussion and awareness building, but specifically education *for* sustainable development, which imparts knowledge and skills for concrete actions towards achieving sustainability (Desha & Hargroves 2014, 5). As Wals and Blewitt (2010) assert:

> In the context of sustainability, we need to be able to switch back and forth between disciplinary perspectives, time perspective (past-present-future), space perspectives (local-regional-global), cultural perspectives and perhaps even between human and other or more-than-human perspectives (Wals & Blewitt 2010, 66).

In this vein they call for “transformative learning,” which helps people to overcome the traditional, ordinary ways of seeing and doing, and making space for new and dynamic thought and action (Wals & Blewitt 2010, 66). This necessitates a shift to a learner-centred approach, collaborative learning, learning through discovery and experience (Sterling 2004a, 58). ESD has a holistic approach and a perspective of lifelong learning, encompassing people of all ages (from children to the elderly), in all settings (family, school, workplace, etc.) and a variety of modalities (whether formal, informal or non-formal). The skills ESD aims to impart on students are in part directed at this very purpose of enabling learning situations even outside of formal educational institutions. (UNESCO 2005, 22.)

Deriving from these basic principles, some key characteristics of successful ESD suggested by the DESD implementation plan (UNESCO 2005) and elaborated by others are:

Interdisciplinarity

Because of the scope of sustainable development, it cannot be taught as a separate subject, but has to be integrated into other disciplines, broaching the borders between different fields, in order to attain multiple perspectives and integrative approaches (UNESCO 2005, 18). As Jones, Selby and Sterling (2010) state: “[S]ustainability presents an overarching and complex socio-economic-ecological context wherein interdisciplinarity – as a putative holistic mode of understanding, organisation of knowledge and inquiry – seems appropriate.” (Jones, Selby & Sterling 2010, 19.) Building on this foundation, students should become competent in systemic thinking, which will give them to tools to better comprehend and handle complex situations by looking at the relationships and links between sustainability issues (Sterling 2004b, 78).

Being values-driven

The principles and values of sustainability should be made explicit, while allowing students the freedom to re-examine, challenge and test these principles – the purpose is not to indoctrinate but to articulate (UNESCO 2005, 18). Many of the crises facing the world today have been brought about due to destructive values such as excessive consumerism, individualism, inequity and materialism. ESD proposes a new set of values to replace these; according to the DESD implementation plan (UNESCO 2005), the underlying values that ESD should promote include: respect for the rights and dignity of all humans, both those alive today as well as the future generations; respect for the greater community of life, entailing the protection and restoration of the world’s ecosystems; and respect for

cultural diversity, entailing the creation of a tolerant, peaceful and non-violent society on both local and global levels. By being unambiguously values-driven, ESD will teach students to identify, understand, evaluate and adopt values conducive to sustainability. (UNESCO 2005, 16.)

Promoting futures thinking

The concept of intergenerational consideration is mentioned in the original definition of sustainable development by the Brundtland Commission (WCED 1987), and the central values of sustainability include the rights of future humans (UNESCO 2005, 16). By encouraging students to look forward and to reflect on consequences of present actions, ESD teaches them, furthermore, to envision paths towards a better future, motivating them to make more sustainable choices now (Tilbury & Mulà 2009, 5).

Promoting critical thinking

Students must acquire the confidence and the mental tools to tackle the challenges of sustainable development (UNESCO 2005, 22). Critical thinking teaches students to reflect on the root causes of the sustainability challenges, by making them examine the hidden premises of knowledge, perspectives and opinions. When the underlying social, political and economic structures are made visible through systematic deconstruction, it becomes possible to change them in a more sustainable direction. (Tilbury & Wortman 2004, 34.) Furthermore, it makes students more apt at navigating the interdisciplinary space of ESD, at evaluating the solutions that arise from any number of different fields (Dawe, Jucker & Martin 2005, 59).

Being collaborative and participatory

Students should be empowered to contribute to their own learning and to learn collaboratively (UNESCO 2005, 18). This is important, because the successful implementation of the principles of sustainable development is a bottom up process. The Agenda 21 programme lines out schemes that require the participation of everyone, a worldwide cooperation of stakeholders. Democracy is vital in this process; historical experience says that autocratic systems are more exploitative of the environment and more plagued with social injustice than democracies. The participatory process calls for respect for the other parties, an appreciation for diversity, and an ability to solve conflicts non-violently. (Rydén 2007, 31.)

Having local relevance

ESD should encourage students to bringing about change in the here and now. Although sustainability challenges are global, the actions taken to solve them should be local. Universities do not exist in isolation from their surroundings, but close connection to and collaboration with the local society is essential. (Dawe, Jucker & Martin 2005, 14, 59.) The contents of curricula should be chosen according to the issues that are locally significant and urgent, while using local languages and methods of communication (UNESCO 2005, 15, 23).

Most recently, UN has set a goal for ESD in the 2030 Agenda for Sustainable Development. In this document, target 4.7 states that by the year 2030 all learners obtain the necessary know-how to advance sustainable development through ESD and education for "human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development" (Transforming Our World… 2015).

3.2 Guidelines in education for sustainable development in Finland

Neither the DESD implementation plan nor the GAP offers a universal model for actualising ESD, because the promotion of sustainable development is dependent on local environmental, societal, economic and cultural circumstances. UNESCO supports nations and organisations in designing and carrying out ESD-related projects, but countries are required to establish their own action plans for ESD. (Sustainable development in education… 2006, 18.)

Finland's strategy for ESD is based on a programme called "An Agenda 21 for Education in Baltic Sea Region – Baltic 21E", which is a joined action plan of all the Baltic countries aimed at making aspects of sustainable development a natural and permanent component of curricula on all educational levels. The programme was approved by the region's ministers in 2002, with Finland being the first country to draw up a national plan to put the programme into effect (Kalliomäki 2007, 16.) Based on the educational vision derived from this programme, a specific goal for higher education was set by the Ministry of Education: a university graduate should have the basic know-how and skills for acting in professional life or as an expert, for civic participation and engaging in decision-making,

as well as for keeping up-to-date with developments within their own field and for research-based innovating, according to the principles of sustainable development. (Sustainable development in education… 2006, 63.)

The national plan for ESD in higher education has not been updated since 2006. Some more recent policies can be found in the educational development plan, which the Finnish government renews every four years. The plan for the years 2011-2016 contains few explicit mentions of actions geared towards advocating ESD, but many of its objectives comply with sustainable development goals, even if they are not worded as such. Lifelong learning is mentioned as a goal, as learning that does not end with obtaining a degree, but continues into adult life. Another objective put forth is the encouragement to active citizenship through fostering participation, opportunities to exert influence, and literacy in political and societal matters. (Education and Research… 2012, 7, 18.)

3.3 Education for sustainable development in practice in Finnish higher education

The resources and the government-level support for the enhancement of ESD in higher education institutions (HEI) in Finland has been occasionally lacking, resulting in widely different directions for the realisation goals of sustainable development. Without sufficient resources and clear guidelines the sustainability work at HEIs is in danger of being ignored. (Asikainen et al. forthcoming.) In spite of this, some HEIs in Finland have been developing their sustainability strategy for several years and have successfully translated policy into practice.

In 2008, two projects funded by the Ministry of Education led to the establishment of the Finnish Forum for Sustainable Development. The Forum meetings cover current global, regional or local sustainable development related actions or practices, as well as the actions the participating HEIs have undertaken. (BUP n.d.) The Forum has not received funding in some years now, so it is left up to the participating HEIs to arrange meetings and seminars. The Forum has a mailing list, which facilitates distribution of information between the HEIs. (Asikainen et al. forthcoming.)

The Education for Sustainable Development in Academia in the Nordic countries (ESDAN) project was carried out by eleven HEI in the Nordic region, lasting from March 2011 until March 2013. From Finland, three HEIs participated: University of Tampere

(UTA), University of Eastern Finland, and Novia University of Applied Sciences. The objectives of the project were to develop a process for incorporating ESD in the higher education curricula, and to recognise and report on the pertinent sustainability themes in various degree programmes in the participating HEIs. On the basis of the project, the HEIs created and implemented management system based processes, integrated in the quality assurance work and audited at a national level, for enhancing ESD at their institutions. (Holm 2014, 14–15, 33, 35.)

In the Tampere region, UTA has been at the forefront of implementing ESD practices in its curricula, beginning with an extensive educational reform in 2010, which presented a convenient opportunity for the integration of ESD into the curricula. Prompted by a policy guideline which lays out the learning objectives of ESD at the university and initiated by the ESDAN project team at UTA, a study module centred on topics of sustainable development was established from already existing courses, free to be taken as optional studies by any student at the university. Since the courses in this module come from a variety of study programmes, it is, by definition, interdisciplinary. (UTA 2013.)

3.4 Education for sustainable development at TAMK

The current TAMK strategy was formulated in 2010, revised in 2014 and 2016, and will be operative until year 2019. The strategy is based on an analysis of the foreseeable trends of the decade, such as widening socio-economic disparity, increasing multiculturalism, and a growing need for lifelong learning skills. Sustainable development is among the values outlined by the strategy, as is communality, respect for individuality and diversity, and appreciation of entrepreneurship and expertise. (TAMKin strategia 2016.)

TAMK has made a public pledge for sustainability through the Commitment 2050 initiative. One of the objectives states that a viewpoint of sustainable development and a sense of global responsibility should be integrated in all TAMK curricula. The aim is to train professionals who have internalised the principles of sustainable development. (Tampereen ammattikorkeakoulun yhteiskuntasitoumus 2015). To this end, the curricula in TAMK will be updated in 2016, with the changes coming into effect in the autumn. (Asikainen et al. forthcoming.)

The sustainability work in TAMK is guided by an advisory group. In addition, the four universities in Tampere, TAMK, UTA, Tampere University of Technology (TUT) and

the Police University College, collaborate in sustainability matters via the Unipoli Green network. The four HEIs in Tampere use this platform for sharing information and co-operating on sustainability projects. In the matter of curriculum renewal, a joint sustainability study module was drafted in December 2015 between TAMK, UTA and TUT, the participants of the Tampere3 process, which is a possible future merger of these three HEIs. The module would be modelled on the one already in existence in UTA, centred on the three themes of environment and society, responsible business and entrepreneurship, and health and global development. Courses from TAMK and TUT would contribute a perspective of natural resource use and technology in addition to the ones from UTA. (Asikainen et al. forthcoming.)

4 METHODOLOGY

4.1 Data collection

The data acquisition for this thesis was done via semi-structured group interviews. Teachers from four different study programmes in TAMK were interviewed: Building Services Engineering on 18 February, 2016, Mechanical Engineering on 30 March, 2016, Environmental Engineering on 25 April, 2016, and Hospitality Management on 4 May, 2016. Invitations to the interview were sent to several other study programmes, but these four were the ones to give an affirmative reply.

Prior to the interviews, the curricula of these four programmes were searched for any sustainability or sustainable development related content mentioned in the course descriptions. The interviews followed a loose outline (appendix 1) with more or less the same questions presented to all the interviewees, but additional questions posed as the need arose. The first questions dealt with course content, the types of sustainable development-related topics found in the courses managed by the interviewees, and whether there were any courses that combined more than one aspect of sustainability. If any courses with descriptions related to sustainable development were found in the initial examinations of the curricula, the interviewees were asked to address these specific courses. The next questions were about the pedagogies and learning outcomes required by ESD. Finally, a question was asked about the opinions the interviewees held about any potential difficulties of implementing ESD at TAMK.

All the interviews had two interviewees each, except for Building Services Engineering, which acted as a “practice” interview, and thus was one-on-one. The interviews lasted between 30 minutes and 1 hour and were recorded for ease of analysis. The interviews were conducted in Finnish, and the translations of the original quotations are by the author of this thesis.

4.2 Interviewing as a research method

In an interview the researcher and the research subject engage in face-to-face interaction, enabling the researcher to direct the data acquisition process, and to get to the motives behind the replies the interviewee gives. Non-verbal cues may help in understanding the

answers, and even give them different meanings than it was originally thought. There are several benefits to employing interviewing as a research method. The interviewee is an active participant and is able to freely bring out issues related to himself. If the area of research is little known to the researcher and she anticipates complex issues to arise from it, this gives her the opportunity to explore it deeply, ask clarifying questions, and request for the reasoning behind opinions. (Hirsjärvi & Hurme 2001, 34–35.)

On the other hand, there are closely related possible difficulties in employing the interview as a research method. To get optimal results from the data acquisition process, the researcher should be a trained and experienced interviewer. Interviews may also contain several sources of errors, either due to the researcher or the interviewee. The interviewee may, for example, attempt to give socially acceptable answers to questions, which in turn will decrease the reliability of the interview material. (Hirsjärvi & Hurme 2001, 35.)

There are different types of interview methods, such as structured, semi-structured, unstructured and informal interviews. In a semi-structured interview the researcher uses an interview guide with questions covering the basic thematic areas she wishes to gather data from. She presents these same questions to all the interviewees, but is able to ask additional clarifying questions or follow topical tangents in the conversation if necessary. (Cohen & Crabtree 2006.)

A group interview can be thought of as a conversation where the participants are able to comment on things spontaneously, make observations and produce diverse information on the area of research. The task of the researcher is to facilitate discussion, while making sure that the topics remain within the given themes and that all the participants get the opportunity to take part in the conversation. (Hirsjärvi & Hurme 2001, 61.)

5 SUSTAINABLE DEVELOPMENT IN THE DEGREE PROGRAMMES AT TAMK

5.1 Building Services Engineering

The Building Services Engineering (BSE) study programme equips students with skills to work in the building trade, with an option to specialise either in electrical services or heating, ventilation and air conditioning (HVAC) services:

> Building services engineering combines the technical services, systems and equipment of built environment. It produces controlled conditions for actions taking place in facilities and spaces. Building services engineering consists of e.g. air, water, heat, energy, light and data transmission as well as safety and mobility services. (Degree Programme in Building Services Engineering 2016.)

The interviewee from BSE for this thesis is a senior lecturer in the study programme and responsible for the HVAC study path. About half of her working time is used for teaching activities, and the other half for research projects.

5.1.1 Course contents in Building Services Engineering

According to the interviewee, although it is not often expressly stated as such, sustainable development is an integral part of BSE and present in much of the teaching. It is dealt with implicitly for the most part, in the form of sustainability themes and topics, but it is an irremovable part of the study programme:

> Mutta voisko sanoa, että talotekniikassa ei voi toimia ilman että on kestävä kehitys mukana. Sen takia se ei välttämättä, meillä ei lue se opseissa välttämättä sanoina, koska se on niin sisäänrakennettu, että ei voi olla sellasta talotekniikkaa jos se ei oo. / *It could be said that you cannot act in building services engineering without the presence of sustainable development. It is not necessarily stated in the curriculum, because it is so inherent that building service engineering could not even exist separate from it.*

The most prevalent sustainability topic in BSE is energy efficiency – in the curriculum, it is found in the descriptions of at least 13 courses (Degree Programme in Building Services Engineering 2016). The interviewee said that energy efficiency is an obligatory aspect of the building trade, and, as she put it, a “must.” Legislation concerning land use and construction stipulates energy efficient building practices for planning permissions

to be granted in the first place. Economic viewpoints are tied with the topic of energy efficiency: students do calculations of cost-effectiveness and repayment periods. The interviewee occasionally asks her students to do an exercise where they attempt to define the term “sustainable development” via mind-mapping. This is usually done on one of her courses as soon as the subject moves to energy efficiency, tying the topic directly to sustainability.

The BSE curriculum contains an optional study module covering several topics related closely ecological sustainability. The module is made up of three courses: “Energy Audit and Condition Inspections,” “Life Span Economy in Building Technology,” and “Energy Efficiency Project.” According to the course descriptions, even here energy efficiency is the focal point (Degree Programme in Building Services Engineering 2016). The interviewee said that other subject matters covered in this module include life cycle analyses and life cycle costing, as well as recycling and carbon footprint. The interviewee stated that this latter subject, carbon footprint, is taught in anticipation of future legislative changes, because as of now, EU legislation does not take it into account.

From a social sustainability perspective the topics that were most evident in course contents were health and safety. The design of ventilation systems is one of the basic aspects of BSE, and the area of expertise for the interviewee. She pointed out that air-conditioning systems today are expressly planned to create indoor conditions that maintain health and well-being:

> Että se on hyvin vahvasti, että monta kertaa ilmanvaihto tänä päivänä, jos mä joskus aikanaan puhun, että ilmanvaihtoa tehdään, että tulee viihtysät olosuhteet, niin nyttehän pääpaino on siitä, että tulee terveelliset, että tää terveysnäkökulma alkaa olla niin, että ei puhuta pelkästään enää vaan viihtyvyydestä, vaan nimenomaan terveellisyydestä. / *The thing about ventilation today is that if once upon a time I said that ventilation is designed to bring about comfortable conditions, then now the emphasis is on health, that this health viewpoint is starting to be so important that we do not talk about comfort anymore but specifically about health.*

Issues related to health or well-being can be found in 4 courses in the BSE curriculum (Degree Programme in Building Services Engineering 2016).

Safety, on the other hand, is discussed in the form of safe working practices. The topic is mentioned in the descriptions of at least 10 different courses in the BSE curriculum, mostly embedded in among the general content of the course: it can be found in connection to safety at construction sites, working with electrical systems, or fire extinguishing

(Degree Programme in Building Services Engineering 2016). In the context of occupational safety, the interviewee brought up the angle of personal responsibility:

> Että tavallaan siis siinä mielessä että ettei aina vaan katota asioita oman navan kautta vaan että sä oot vastuussa myös, että sä et ole vaaraksi myös muille. […] Eli sun täytyy viestittää, sun täytyy oppia tietämään se, että no mihin sun täytyy tarttua, että minkälaista se sitten on, että ei ainoastaan sitä että sä näät vaaran ja kauhistelet, vaan että sulla on vastuullisuus viedä tietoa eteenpäin. / *You have to learn not to be self-centred, but that you also bear responsibility for not causing hazards to others. […] You have to communicate, you have to learn to take action, not just to see a danger and stand there horrified, but pass on the information.*

This sense of responsibility extends to their future clients as well as their co-workers. Since their clients are unlikely to be as aware about relevant safety regulations as they are themselves, the interviewee pointed out that it rests on the students to pass on and communicate their knowledge. Furthermore, safe working practices are important not only for the safety of the acting individual, but also for their colleagues who may be injured by careless actions.

The interviewee gave industrial ventilation, taught as its own course in the BSE curriculum, as an example that combines the environmental (energy efficiency) and social (health) sustainability aspects:

> Niin teollisuusilmanvaihdossahan, okei, siinä on tietenkin se energiatehokkuus, se on kaikissa, että se on niinku itsestäänselvää. Mutta teollisuusilmanvaihdossa on vahvasti myös se, että se terveysnäkökulma. / *Industrial ventilation, there is obviously the energy efficiency aspect, it is self-evidently in everything. But in industrial ventilation there is also strongly the health point of view.*

In addition to the environmental and the social dimensions, in the curriculum there is a single course called “Enterprise Economics,” whose description contains a mention of corporate social responsibility, among themes such as entrepreneurship, marketing, product design and national economics (Degree Programme in Business Services Engineering 2016).

5.1.2 Pedagogies and learning outcomes in Building Services Engineering

Collaborative learning appears to be a significant part of the BSE programme. Many courses are taught by a team of teachers, bringing in numerous viewpoints and a wide

array of know-how. Project work is common – the interviewee mentioned a building services clinic where any of the students or staff at TAMK could come with their building renovation-related problems for the BSE students to solve (TAMK 2016). A degree of interdisciplinarity is introduced through collaboration with the construction engineering and electrical engineering study programmes. The interviewee stated that learning to deal with different people and different viewpoints is considered an important part of the students' future careers. They will not be able to choose for themselves the group of people they will be collaborating with on future building projects, so they have to know how to work with a variety of people.

Collaboration with people outside TAMK is common in the form of projects, as well. The theory that has been learned at school will be applied to real-life situations, to work with real customers and to build real social networks. TAMK itself is used as a real-life learning environment for practical work; TAMK's building services often bring up problems for BSE students to solve within the premises of the school. These surroundings are fruitful for learning, according to the interviewee, because different parts of the campus have been built in different times, and so students will see many kinds of structural designs from various time periods.

Students also will use the knowledge they have acquired to look at their own habits and behavioural patterns, i.e. by measuring room temperatures at their homes or the amount of water consumption during showers. This is done also as a critical thinking exercise. The students will compare their results to one another and see that their living habits vary from each other a great deal. This will force them to question underlying assumptions of what types of consumption habits are typical:

> Mikä on sitten niin sanottu normaali-ihmisen juttu, että kun huomataan, että siinäkään porukassa ei löydy normaalia. Niin siis tavallaan siis tätä että pistetään väkisin itte pohtimaan, että jos minä käyttäydyn näin, niin onks se yleinen totuus. […] Että tulis sitä kriittisyyttä. / *What, then, is a so-called normal person's level, when we can see that in that group you cannot find normality. So in a way it is that they have to reflect on the fact that if I behave in this way, is it a universal truth. […] So that there would be that critical thinking there.*

Along these lines the BSE students are encouraged to discover and find out issues for themselves. The interviewee brought this up in connection to the rapidly morphing nature of the building trade:

> Meillä on vahvasti tämmönen selville ottamisen oppimistapa. Eli on se linja, että ei niin vaan, että minä tässä vaan opetan, vaan annan vinkkejä ja näkökulmia, ja haetaan tietoa siitä ja muuta, koska voisko sanoa talotekniikka on niin voimakkaasti kokoajan elävä. / *We employ an investigative learning technique. We have a policy that it is not that I just teach, but I give hints and perspectives, and we look for information about the subject and so on, because you could say that the building trade is always undergoing changes.*

Even though the basics remain the same, such as the laws of physics related to heat transfer and flow of currents, the technology as well as the legislation are constantly changing. Therefore, she asserted, a one-direction flow of information – teachers dictating facts for the students to absorb – would be counterproductive. The teachers, in her view, are there to instruct in the independent search for knowledge, e.g. by helping students to assess the reliability of different sources of information.

The rapidly changing nature of the field also means that students have to learn to look into the future, but also into the past. The interviewee said that while working in their field, they are likely to come across older buildings, which differ structurally and schematically from what they have learned during their studies, and they will have to know how to deal with these situations. In the curriculum, there is a course dealing with building maintenance and renovation, with the course description specifically centred on these issues (Building Services Engineering 2016). The interviewee stated that the students will have to know not only how to build new things, but also how to think of the things they have learned relative to the housing stock that is already in existence.

The students have to be able to stay up-to-date with the legislative and technological changes in the building trade. A course called “Questions of the day in Building Systems Engineering” is focussed on the current issues in the field, with the course’s contents varying from year to year according to what is relevant at that moment. The learning outcomes listed in the curriculum for this particular course is that the students will be aware of local and global trends in the building trade and will be able to critically examine them. The contents revolve around new policies and technological innovations in construction, and how these are related to old practices. (Degree Programme in Building Services Engineering 2016.) The course is meant to be taken in the spring of the fourth year, as an update for students on the brink of graduation. This is deemed necessary, the interviewee said, since during the three and a half years since the students began their studies, regulations may have changed. She gave an example, which also illustrated the need for comprehending past practices:

> Viime vuonna tuli just sillä tavalla hassusti että oltiin hienosti opiskeltu kun että miten kaukolämpö on, ja sitten paukahti uus kaukolämpöohjeistus, että sitten oli että äkkiä nyt päivitetään juttu, että unohdetaan, että ei niitä nyt sitten enää saakaan tehdä näin. Mutta on hyvä tietää, että kentällä on tämmösiä, jatkossa teette siis näin. Mutta ymmärrätte miksi toi on ajateltu noin. / *Last year this funny thing happened where we had only just studied how district heating is, and then we got new district heating guidelines, and then we had to suddenly update the whole thing, forget about the old ways, that we are not allowed to do things in the old way anymore. But it is good to know that there are things like these out in the field, and in the future you will act like this. But you will understand why [the old systems are configured like that]*.

Systemic thinking comes in the BSE programme as a part of picturing the constructed environment. The interviewee brought this up in connection to the way the building trade is limited to the borders of the building site, but this site is still a part of the surrounding infrastructure:

> Täähän on oikeestaan meilläkin aika paljon ”must”, kun meillähän aatellaan aina taseina. Ja talotekniikan taseena on rajattu siihen, että asiat mitkä tapahtuu tontilla on se meidän taseraja. Ja sen jälkeen kun mennään tontin ulkopuolelle, ei tavallaan talotekniikka ei vastaa siitä mutta […] vaikka nyt että vesihuoltotekniikka, lähtee viemäri jonnekin, mutta siis talotekniikka ei rakenna vesihuoltoviemärilaitosta. Mutta sun täytyy ymmärtää lainalasuudet mitkä sinne menee. / *This is more or less a must for us, because we always think in balances. And the building services engineering balance is restricted to the things that happen in the building plot. And when we go outside the plot, in a way building services engineering is not in charge of that, but […] for example water supply engineering, there is a sewage line that goes somewhere, but so building service engineering does not build the waste water treatment plant. But you have to understand the rules that govern that system.*

The interviewee asserted that international and intercultural collaboration does not receive a central position in BSE, due to legislative differences in the building trade between countries. Similarly, the environmental conditions (such as the climate or occurrence of earthquakes) will vary from country to country, so the students will have to know how to act in Finland, specifically. Students going into exchange may have difficulties in getting the courses they have studied abroad credited, because there is knowledge specific to Finland that they will have to obtain in either case.

5.2 Mechanical Engineering

The Mechanical Engineering (ME) degree programme in centred on designing and constructing machinery according to a specific set of principles:

> The basic values of design, manufacturing and maintenance focus on high quality, safety, appropriateness, functionality and customer satisfaction regarding the machines and devices needed in the industry and in private use. Equally important values include the ease of use, pleasant exterior features, ergonomics, recycling regulation and fulfilment of environmental norms. (Degree Programme in Mechanical Engineering 2016.)

The programme offers a choice between five study paths: machine automation, product development, intelligent machines, production engineering and aircraft engineering.

Both of the interviewees from the ME study programme for this thesis are relatively new additions to the TAMK staff. Interviewee A is a senior lecturer, and responsible for the production engineering study path. In addition to teaching, he is involved in a variety of projects and thesis supervision. Interviewee B is a lecturer in energy technology, as well as in some computational, administrative and economic subjects.

5.2.1 Course contents in Mechanical Engineering

Although at the moment the course descriptions in the ME curriculum do not show much sustainability-related content (Degree Programme in Mechanical Engineering 2016), the curriculum is slated for changes towards sustainability in the near future. Unfortunately, neither of the interviewees were able to give information about these changes as of yet, because they are not due to being implemented until autumn 2016.

Despite the lack of expressly stated sustainability-related content in the curriculum, the interviewees were able to identify several such topics in their own courses. Interviewee B saw the topic of energy production as a fundamental part of sustainable development, as well as a key component of ME studies:

> Interviewee B: Meidän täytyis pystyä sellaseen energiantuotantoon, että se ois hiilineutraalia, se olis luonnonvarojen käytön suhteen neutraalia. Neutraali luonnonvarojen käyttöhän ei tietenkään tarkota sitä, ettei niitä saa käyttää, vaan niitä pitää käyttää sen verran kun ne uusiutuu. Ja siinä kohtaa uusiutuvat energianlähteet on nimenomaan sellanen, jonka mä koen menevän tän otsikon ”kestävä kehitys” alle. / *We should be able to achieve the kind energy production which would be carbon neutral, which would be neutral when it comes to usage of natural resources. Neutral natural resource use does not of course mean that they cannot be used, but they have to be used to the degree that they are renewable. And that is where renewable energy sources are specifically what I feel belongs under this title of “sustainable development.”*

Regarding this topic, the various biofuels used industrially for electricity and heat production are discussed in the courses of this interviewee. The fuel-efficient method of combined heat and power production is among the themes, and specifically how in Finland bio-waste originating from the forests and the agricultural fields is made use of in this capacity. In some of his courses there are calculations of carbon dioxide emissions from various forms energy production.

Interviewee A saw components of sustainable development in courses dealing with material and production engineering:

> Interviewee A: Tietysti kun noita [kestävän kehityksen aiheita] lähtee tavallaan purkamaan, niin tietysti kun puhutaan tuotannosta, tuotannonsuunnitelusta, aina haetaan sitä tehokkuutta, kyllä se tavallaan käsi kädessä hieman on tän kestävän kehityksenkin kanssa. Ei tuhrata niitä resursseja, energioita, tehdään tuotannonsuunnittelun läpimenot sillein että saadaan kaikki mahdollisimman hyvin läpi. / *Of course, when you start to decipher those [issues of sustainability], then of course when we are talking about manufacture, manufacture design, we are always looking to achieve efficiency, and in a way it goes hand in hand with this sustainable development. We do not waste those resources, that energy, we do the manufacturing design so well that we get everything done as well as possible.*

Further aspects in his courses that he identified to be related to sustainable development were issues such as recycling of materials and tools, machinery maintenance and repair, and water use at paper mills, particularly the closed white water system. He said that although these topics are covered, they are not named as sustainable development.

During the course of the interview, the fact that environmental concerns are present in ME as self-evident and unspoken came up several times:

> Interviewee A: Sitä ei kukaan vielä ymmärrä että kuinka paljon me oikeestaan sitä painotetaan, se vaan tulee siinä ohessa. Että meidän pitää ottaa joku, esmes materiaalien kierrätettävyys että sen elinkaarensa lopussa se voidaan käyttää uudelleen että se ei oo jätettä ja tämmöset asiat, niin kyllähän ne tuolla tuotekehityksen kurssilla opetetaan. […] Mutta ei sitä ajatella ehkä vielä sillä tavalla että tää on nyt sit se lokero vaan se on vaan osa sitä hyvää insinöörityötä. / *It is not yet understood by anybody how much emphasis we actually put on it, it just comes there alongside everything else. That we have to take some, for example, recyclability of materials, that at the end of its life cycle it can be reused, that it is not waste and things like these, so yes, we do teach these things in the product development courses. […] But it is not thought of in the way that this is that box [of sustainability], but instead it is just a part of good engineering.*

From the social sustainability perspective, safety is the most relevant for ME, both in the form of occupational safety as well as an ability to design safe machinery. Interviewee B

said that 20 to 30 years ago, this was not as obvious as it is today, but now at many companies, work safety is a top priority, as a part of quality management systems or otherwise. An ingrained knowledge of safe working practices, therefore, is a core competency for ME students. Safety can also be seen to increase productivity, so prioritising it makes economic sense, as well, and Interviewee A saw a connection between safety, productivity and sustainable development:

> Interviewee A: Se on myös tutkittu juttu että se turvallisuus tuo myös hyvää sinne tuottavuuspuolelle. Ne menee ihan käsi kädessä ja näkisin ihan, sitä vois melkein vielä laajentaa että se turvallisuus, se kustannustehokkuus ja sitten kestävä kehitys, mä näkisin, ne kaikki vois laittaa yhteen nippuun. Ettei ne oo irrallisia asioita vaan kun tehdään turvallisesti, tuottavasti asioita niin en mä nyt sano että automaattisesti tulee se kestävä kehitys mutta kyllä se tulee sieltä niitten mukana osaltaan myös. / *The fact that safety brings benefits to the productivity side of things has been recognised. They go hand in hand, and I could even say that [the idea] could be extended to that the safety, the cost efficiency and then the sustainable development, I could say all of them could be bundled into one. So that they are not separate issues, but when we do things safely, productively, then I am not saying that sustainable development will be there automatically, but it will partly come there among the other things.*

In addition to the courses taught by the interviewees, the basic studies in the ME curriculum include “Environment and Chemistry,” the description of which lists the principles of environmental management, the environmental responsibility of companies, and material recycling among the course contents (Degree Programme in Mechanical Engineering 2016). As such, the ME curriculum does not appear to include explicit sustainability-related content beyond this one course. However, Interviewee A said that the ME students are free to take part in a 25 ETCS study module based on themes of sustainable production managed by TUT, shared between TUT and ME within the Tampere3 network. Most of the course contents in this module are focussed on environmental concerns, but also some health and ethics related issues are included. (TUT 2015.)

A single course called “Industrial Economics” can be found in the ME curriculum, with topics such as management accounting, investments, taxation, marketing and enterprise resource planning (Degree Programme in Mechanical Engineering 2016).

5.2.2 Pedagogies and learning outcomes in Mechanical Engineering

The students engage in plenty of project work, and this combines interdisciplinarity, collaboration with parties outside of TAMK, as well as teamwork. Interviewee A said that

ME is a part of the Protopaja network, where companies give cases for students to solve, and some projects involve interdisciplinary groups of different engineering students. (See Pirkanmaan Protopaja-pilotointi 2013.) Even outside of project work, both of the interviewees agreed that collaborative learning is fundamental in ME to the degree that individual work can even be said to be minor in comparison. Occasionally, students request that they be allowed to do an assignment on their own, and have to make special arrangements for this to be possible.

Debating was seen by Interviewee B as a particularly fruitful critical thinking exercise, enabling critical discussion around the topic at hand. However, he also thought that on some issues students might be reticent to discuss topics they feel they do not have enough knowledge on or interest in. The problem is time-related: students may not have enough time within the course to prepare well thought-out arguments. In addition to debates, the interviewees also on occasion have purposefully made provoking statements in class, to stimulate counterarguments from the students.

As an example where systems thinking is a part of ME studies, Interviewee A mentioned production engineering studies, where the whole production chain must be understood. The other interviewee opined that systems thinking skills are, in fact, essential for an engineer:

> Interviewee A: Kyllä mä ainakin mitä tahansa uutta asiaa, tai ylipäätään kun asioita käydään läpi, niin yrittää sen niinku perustella mihin se liittyy, ja mikä se iso kuva ja kokonaisuus on, niin kyllä ihan se tilauksen ja toimituksen ketju pitää ymmärtää ja ei pelkästään sitä yhtä yksittäistä prosessin osatekijää. / *At least I on any new subject, or when going over any subject at all, I try to establish what [issues] it relates to and what the big picture and the whole is, and so that the entire supply chain has to be understood and not just the one unit of the process.*
>
> Interviewee B: Eiköhän se oo suorastaan insinöörin tehtävä hahmottaa nää asiat aika suurina kokonaisuuksina. / *I would even say that it is the job of an engineer to picture these things as wholes.*

Interviewee B brought up the forwards-looking time perspective in context of decision-making in the present:

> Interviewee B: Ja se, että tänne edelleen tulee hiililaivoja satamaan, niin se johtuu niistä päätöksistä mitä me ollaan tehty kakskymmentä tai kolmekymmentä tai neljäkymmentä vuotta sitten. Mut nyt me ollaan oikee hetki tehty niitä päätöksiä, mistä me sitten korjataan sitä satoo kahenkymmenen vuoden kulttua. Ja esimerkiksi nää verotukselliset asiat on yks sellanen asia,

> että verotetaanko jotain metsätaloudessa syntyvää jätettä, jota voidaan käyttää polttoon ynnä muuhun, verotetaanko jotain tiettyä tapaa käyttää energiaa tai tuottaa energiaa eri tavalla kun muita. Niin nehän on niitä päätöksiä, joiden perusteella tehdään niitä pitkäkestosia investointeja. / *And the fact that coal ships are still coming into harbour here, that is because of the decisions we have made twenty or thirty or forty years ago. But now at the right moment we have made the decisions that we will reap the rewards from in twenty years. And for example these taxation-related issues are one of the things, that do we tax some waste originating from forestry that we could use for combustion, et cetera, do we tax some specific way of energy use or energy production in a different way than others. These are the decisions we base our long-term investments on.*

The interviewees saw that TAMK has good prerequisites of being on the forefront of sustainable development work. This angle could be used in marketing and attracting more students. However, Interviewee B speculated about the difficulty in explicitly bringing up sustainability themes to his current students, due to a possible adverse reaction they might have to this subject matter:

> Interviewee B: Siinä on tietysti tällänenkin asia, että joka kerta kun mä tuolla energiatehokkuuden kurssilla, taikka energiakäytön kurssilla mä esimerkiks sanon sanan ”hiilijalanjälki”, niin osa porukasta on hypoallerginen tälläselle nimitykselle. Ja kuikuilee toisiaan että jahas, siellä se viherpiiperö nyt rupee puhuun jotain. / *There is of course also this issue that every time when I mention on the energy efficiency course or on the energy use course, for example, the word “carbon footprint,” then a part of the group will be hypoallergic to this label. And they glance at each other and go, “Okay, the tree hugger is going on about something over there.”*

Interviewee A agreed, and this is why neither of them use sustainability-related terms, even if sustainability concerns are, in practice, integral to their courses.

5.3 Energy and Environmental Engineering

The Energy and Environmental Engineering (EEE) (formerly Environmental Engineering) degree programme is aimed at providing students with skills to act as engineering professionals in the growing environmental field:

> The graduates of TAMK Environmental Engineering Degree Programme can steer the processes of industrial and public production and services in a sustainable and environmentally sound manner. They know to take into account the principles of sustainable development, material and energy efficiency, process emissions and environmental management. (Degree Programme in Energy and Environmental Engineering 2016.)

Interviewee A from the EEE study programme for this thesis is a laboratory engineer as well as a teacher. Her subject matters are centred on waste management, material efficiency and recycling, as well as organising the annual Water Day event. Interviewee B is a project engineer and a part-time teacher, with her courses covering administrative and legislative subjects, as well as some occupational safety issues. She also acts as an assisting teacher on several other courses, for example in the laboratories.

5.3.1 Course contents in Energy and Environmental Engineering

The interviewees felt that sustainable development is an inherent part of EEE, even if the relevant themes are not always brought under the single umbrella of "sustainability":

> Interviewee B: Sikäli mun mielestäni Envellähän [kestävä kehitys] tulee hirveen luonnollisesti silleen niinku, toisaalta mä mietin kyllä sitä, että se voi olla niinkin, että se on niinkun oletuksena tavallaan siellä, mut mä en tiedä miten tietosesti sitä ajatellaan. / *On the one hand I think that in Enve [sustainable development] comes very naturally, but on the other I do think that it might be taken for granted, but I do not know how explicitly it is being handled.*
>
> Interviewee A: Joo, en mä ainakaan pohdi, että tää osuus oli nyt jotain kestävää kehitystä mitä mä opetuksessa sanon tai teen, mut mä pyrin kokoajan käsitteleen asioita niin, että me todella säilytettäis kaikki asiat täällä niinku on, tai mennään parempaan suuntaan, eikä ainakaan huonompaan suuntaan. / *Yes, I for my part do not think that this or that particular segment in my teaching was about sustainable development, but I try to always approach things so that we could indeed maintain everything here as it is, or go in a better direction, or at least not in a worse direction.*

Even so, sustainable development is also many times unambiguously present:

> Interviewee A: Kestävä kehitys tulee ihan terminäkin siellä materiaalissa. ”Sustainable development” on niinkun semmonen sanapari mikä toistuu ja toistuu ja toistuu siellä sen materiaalin läpi. / *Sustainable development comes up as a term in the materials. The two words ”sustainable development” are repeated over and over and over again throughout the materials.*

In the EEE curriculum the term "sustainability" or "sustainable development" is included in the descriptions of four courses, twice in connection to sustainable resource use and one to sustainable production. In addition, the course called "Basics of Environmental Management" lists the understanding the concept of sustainable development as an expected learning outcome for students. (Degree Programme in Energy and Environmental Engineering 2016.)

Of the three dimensions of sustainable development, environmental issues are the most prevalent, as the name of the study programme suggests. The descriptions of at least 21 courses in the EEE curriculum contain mentions of some topics related to environment: pollution, ecosystems, water, waste, recycling, energy or general environmental management (Degree Programme in Energy and Environmental Engineering 2016).

Social issues are a part of the management and administrative courses. Occupational health and safety is listed among the contents of two of these courses, "Risk Assessment and Management," which includes management of risks to both people and the environment, and "Personnel Administration and Work Life Skills," where a part of the course is that the students get the training and do the exam to receive an Occupational Health and Safety card. The six courses dealing with pollution and emissions could also be said to be directly health-related, as well as the "Water and Sanitation" course, and thus these combine the environmental and the social viewpoints. (Degree Programme in Energy and Environmental Engineering 2016.)

Two courses, "Public Administration" and "Infrastructure and Community Development," are described as having public participation-related content, which is an important skill for ESD. Ethics and a sense of responsibility are most evident in the course called "Environmental Ethics," but "Personnel Administration and Work Life Skills" also has among its learning outcomes an expectation that students will learn of their work life responsibilities. (Degree Programme in Energy and Environmental Engineering 2016.)

Based on the course summaries found in the curriculum, there is only one course dealing with economic issues, "Industrial Economics and Marketing," which has listed topics such as size and organisation of firms, business strategy, pricing behaviour, and productivity among others. It is possible that other courses dealing with subjects like material or energy efficiency mention industry and companies and may also include economic concerns in this context (Degree Programme in Energy and Environmental Engineering 2016.)

5.3.2 Pedagogies and learning outcomes in Energy and Environmental Engineering

Several of the basic tenets of ESD were seen by the interviewees as an intrinsic part of EEE. The living conditions of future generations comes as a natural consideration with

ecological themes. One of the interviewees gave an example from her waste management courses:

> Interviewee A: Me puhutaan noista muovijätteistä merissä ja kaikista tämmösistä asioista, jotka on ihan globaaleja ongelmia, ja mitä että jotain on tehtävä. Siis sehän tulee joka paikassa jätehuollossa esille, että jotain on tehtävä, että näin ei voi jatkua. […] Nehän on just tulevaisuuteen tähtäävää, että millain ne saatais pois, että niitä ei tulis ainakaan lisää. Ja nykysetkin pitäis saada hävitettyä. / *We talk about plastic waste in oceans and all these types of subjects that are global issues and that something has to be done. I mean, it comes up everywhere in waste management that something has to be done, that we cannot carry on like this. […] That is a precisely forwards-looking perspective, how we can get rid of it, or that we would at least not make any more of it. And what we have now should also be eradicated.*

The other interviewee saw similarly the necessity for futures thinking in her administrative courses:

> Interviewee B: Mutta myöskin sitten se, että hallinnossa ylipäätään se, että oikeesti kun tehdään hallinnollisia ratkasuja, niin nehän on hirveen pitkäkantosia aina. Koska ne prosessit on pitkiä, ja saattaa olla että ihan oikeesti, että esmes kaavotuksessa menee vaikka kymmenen vuotta ennen kun sitä aletaan suunnitteleen, ja sitten se oikeesti kaavotuspäätös tehään. / *But also in administration, when administrative decisions are made, they are always really long-term. Because the processes are long, and it might really be that, for example, in zoning it takes ten years before planning is started and then the zoning permit is granted.*

Systems thinking is an elemental part of environmental studies, so much so that it feels inseparable:

> Interviewee A: Sitähän nyt toitotetaan koko ajan kaikessahan kaikki vaikuttaa kaikkeen, että kyllä mulla se ainakin tulee tuolla omilla kursseilla. Mitkä seuraa, tästä seuraa tää ja tää ja tää, ja sithän se on se ympyrä. Mut sitä ei osaa erotellakaan sieltä sisällöstä sillain, koska se on jotenkin niin ittestään selvästi siellä. / *It is being trumpeted all the time in everything that everything influences everything, so at least in my own courses this comes up. What follows, this is followed by this and this and this, and that makes the cycle. But I cannot even separate it from the contents, because it is somehow so self-evidently in there.*

The interviewees talked about the new project work course unit, implemented for the first time in its current form in autumn 2015, combines interdisciplinarity as well as collaboration with outside companies. The project is done with students from the other engineering study programmes, receiving assignments from companies. Within EEE, interdisciplinarity shows in the form of overlap between courses, for example, when language studies are integrated in some ecological science courses, by using the same written reports

for both. Foreigners in the programme have combined their Finnish studies with a chemistry laboratory course, by making a small movie in which they explained their laboratory assignment in Finnish.

Even outside of project, collaborative work is common. Interviewee B said that within her courses there is always at least one group assignment, and laboratory work is always done in teams. Discussion and comments in class are encouraged. Students find out things for themselves, and present the results of their research to the rest of the class. Critical thinking skills are taught in one of the interviewee's courses via reflection on one's own life:

> Interviewee B: Noissa nykysissä kursseissa mitä on mulla, mä oon käyttäny sitä että opiskelijat joutuu miettiin niitä asioita oman elämänsä kautta, että ne joutuu ottaan omasta elämästään niihin ne esimerkit. Niinku että mikä siellä olis sellasta. Jos puhutaan esmes periaatteesta niin sillon ne joutuu havainnollistaan ne oman kokemusmaailmansa kautta. / *In the courses that I have right now I have been using the method where students have to consider the issues through their own life, they have to find examples in their own life. Like what would be relevant in there. If we talk about a principle, for example, then they have to illustrate it through their own experiences.*

EEE is one of the study programmes in TAMK that is taught in English in its entirety, and thus a large portion of the student body originates from a variety of cultures. The interviewees saw that this alone made multiculturalism an inherent part of EE. The students will have to learn intercultural communication skills to be able to cooperate with many of their classmates; furthermore, they will hone their English skills, which, as the global *lingua franca*, will enable them to interact with many more people across the world than they could if they were fluent only in their mother tongue.

Interviewee B had received plenty of feedback mentioning sustainable development-related learning outcomes from students, in addition to the issue being a commonly discussed subject matter in essays and other written assignments. She thought that students had a good knowledge of sustainable development as an issue, but was unsure how well they had internalised it. She speculated that there is a way to assess this level of internalisation by looking at how much students implement the principles of sustainability in any practical course work they might do:

> Interviewee B: Kyllä sen pystyy mittaamaan […] esimerkiks siinä participation, siinä osuudessa [kurssiani], siinähän se kestävyys tulee nimenomaan, koska se osallistaminen koskee yleensä jotakin aluesuunnittelua tai jotakin kaavotusta tai jotain sellasta, niissä tulee, semmosissa

> konkreettisissa ympäristöön liittyvissä asioissa tulee kyllä helpommin esiin se, että miten sitten ajatellaan, esimerkiks vaikka suunnitelussa otetaan se kestävä kehitys huomioon ja tällein näin. / *You can measure it […] for example, in the participation, in that segment [of my course], that is where sustainability specifically comes up, because the participation usually involves some sort of regional planning or some sort of zoning or something like that, there comes, in that type of concrete environmental issues it is more evident the way we think, for example, in planning we take sustainable development into account and so forth.*

The interviewee also expressed concern that the term may have suffered an inflation through overuse. People may feel it is a cliché; but then again, it may remain an underlying assumption without doing the groundwork to make sure it actually is a part of what is being taught:

> Interviewee A: ”Sustainable development”, se on niinku varmaan, sitähän joskus sanotaankin että se on semmonen vähän niinku mantra, se on kulunu jo. Kun sitä on niin paljon käytetty. / *”Sustainable development,” it might be, it is sometimes said that it is a type of a mantra. Because it has been used so much.*
>
> Interviewee B: Mutta kyllähän niistä kliseitä tulee helposti tommosista [termeistä]. Sitten toisaalta niistä tulee taas helposti oletuksia. Että oletetaan vaan et ne on siellä. Eikä oikeesti mietitä sitä että onks ne ny oikeesti siellä. / *But those kinds of [terms] do easily become clichés. And then again they might easily be taken for granted. So that it is just assumed that they are there. And it is not considered whether they are actually there.*

Interviewee B furthermore thought that sustainable development should be explicated and explored in basic studies of the first year in all the engineering study programmes in TAMK. She opined that the aspects of sustainable development should be thoroughly analysed and the ideas behind the concept examined, because only in this way students will truly grasp the idea and be able to apply the theory into practice. She drew a comparison between her own course contents:

> Interviewee B: Tossa esimerkiks kun me ollaan käsitelty hyvän hallinnon periaatteita. Niin jos ei niitä nimenomaan tavallaan mainita ja avata sitä, että mikä se idea siellä niissä on, ja miksi ne on määritelty, niin ei opiskelijat sillä tavalla abstraktioina niitä ajattele itestään. Eikä ne ajattele kyllä sitä kestävyyttäkään mun mielestä välttämättä itestään, tavallaan, ettei se välttämättä tuu äidinmaidossa. / *For example, we have been going through the fundamental principles of good administration. If [these principles] are not specifically mentioned and spelled out what the idea behind them is and how they have been defined, the students will not think of them as abstractions by themselves. And I do not think they will necessarily think of sustainability either, by itself, in a way, because [this knowledge] is not inborn.*

She also was of the opinion that students should be led to understand the fact that sustainable development comprises the three different dimensions of environmental, social and economic, instead of just the environmental, because this false image of sustainable development may make it harder for some engineering students to swallow:

> Interviewee B: Että kestävä kehitys ei ole pelkästään sitä, että luonnonarvot otetaan huomioon ja ympäristöarvot, että koska helposti kestävä kehitys on kyllä leimautunu semmoseks pelkästään ympäristön kehityksen termiksi. Ja mä vähän pelkään, että se on leimautunu pikkasen liikaa semmoseks, tämmöseks vihertäväks termiks, mikä sitten taas insinöörikoulutuksessa ei välttämättä oo kaikilla, kaikissa koulutuslinjoissa pelkästään hyvä asia. / *Sustainable development is not just about taking natural values into consideration and environmental values, because commonly sustainable development has been branded only as a term of environmental development. And I am a bit worried that it has been branded a little too much as a greenish term, which then again in engineering education is not always for everyone, in every study programme, merely a positive thing.*

She pointed out that on a governmental level the sustainability guidelines do not come from any environmental departments, but from the UN:

> Interviewee B: Ja sitten kun se ei oo Ympäristöministerin lanseeraama, se ei oo niinku EU:n ympäristö, vaan se on ihan oikeesti YK:n kestävän kehityksen periaatteet jotka tulee sieltä, niitä pitäis implementoida ihan niinkun kaikilla yhteiskunnan kehityksen aloilla. / *And then because it does not originate from the Ministry of Environment, it is not like EU's environmental, but instead it really is the UN's sustainable development principles that come from over there, they should be implemented in all developmental sectors of society.*

5.4 Hospitality Management

The Hospitality Management (HM) curriculum describes the programme as follows:

> The degree programme provides extensive abilities for working in hotel and restaurant management and catering and facility services. Graduates of the degree programme can plan, organise, develop and market as well as work in supervisory duties of tourism, catering and domestic services. (Degree Programme in Hospitality Management 2016.)

Both of the interviewees from the HM degree programme are senior lecturers and involved in several of the study modules in the programme. Both also teach in the Management of Service Business master's degree programme at TAMK.

5.4.1 Course contents in Hospitality Management

Sustainable development and the values related to it are, according to the interviewees, an integral part of HM, even when it remains unspoken:

> Interviewee A: Ei me nyt puhuta että tää on kestävää kehitystä vaan se kuuluu tähän toimintaan […] se on sisäänrakennettu osa kaikessa. / *We do not say that this is sustainable development, but it is a part of all our operations, instead […] it is an inbuilt component in everything.*

Environmental aspects play a large part in HM teaching. One of the very first courses the students take, "Introduction to Field," is divided to several themes, one of which is the environment. As a part of this course, students are required to obtain the "Ympäristöpassi" certification for hospitality management professionals, for which they have to pass an online exam (Ympäristöosaava n.d.). According to Interviewee A, in some larger companies in this field having this certification is nowadays a requirement for all employees. The knowledge and values that students absorb in this course forms a basis for the rest of their studies.

The most prevalent environmental topic the interviewees identified within HM is food waste management. This is tied to both environmental and economic concerns. At the HM learning facilities in TAMK, a relatively recently constructed catering studio, they are constantly keeping track of waste, and food waste in particular. To decrease the amount of food that has to be thrown out, the students are allowed to take it home with them for nothing more than the cost of packaging. In addition, attention is paid to the packaging sizes of ingredients purchased for the catering studio. This ensures that food waste is minimised already at the moment of purchase.

According to the interviewees, energy and water usage are also issues that are closely linked to the hospitality industry. These issues are covered specifically on the course called "Machines and Appliances." Interviewee B pointed out that dishwashing consumes a significant amount of water, and that at the catering studio this issue was taken into account as it was being planned:

> Interviewee B: Toi oppimisympäristö tuolla catering-studiolla, niin sehän on kolme vuottako se on nyt ollu meillä käytössä, et nyt kun sitä rakennettiin ja suunniteltiin, niin siinähän huomioitiin ja yritettiin huomioida just se, että tää kestävän kehityksen mukaisesti, että sinnekin nyt tää astianpesukone valittiin, niin siinähän oli valintakriteerinä just se että se, sellanen kone, joka käyttää kaikkein vähiten vettä ja energiaa. / *The learning environment at the catering studio, has it been three years that we have been using it, and so when it was being built and planned, sustainable development issues were taken into account, and so the dishwashing machine was selected, and one*

> *of the selection criteria was precisely that, the kind of machine that consumes the least amount of water and energy.*

HM makes use of a pre-prepared cleaning system at the catering studio, which takes environmental considerations into account. It uses less water than traditional cleaning methods, eliminates the necessity of using cleaning chemicals, and utilises reusable microfibre cloths. (Matilainen 2014.) Interviewee B said that one of the central matters taken into account when this cleaning method was being developed was specifically sustainable development.

Interviewee A speculated that environmental concerns are a growing trend to the degree that soon companies will not have any choices but to act in an environmentally sustainable manner, due to demands from various sources:

> Interviewee A: Eiköhän se lainsäädäntökin ainakin isoissa yrityksissä velvota tähän sitten kohta, et jos yli viissataa työntekijää, jos on, niin pitää olla näitä ympäristö, ympäristöohjelmat ja muut. […] Ja sitten tietenkin toi asiakkaiden vaatimukset että tietenkin sieltähän tulee ja sidosryhmien vaatimukset, niin aika voimakkaana että yhteistyökumppaneilta vaaditaan tätä kestävän kehityksen huomioonottoo koko toiminnassa. Se tulee niinku monelta suunnalta. Että ei oo enää oikeesti vaihtoehtoja muuta kun toimia kestävästi. / *I think that even legislation will soon oblige this from at least big companies, that if there are over 500 employees, if there are, then there has to be all these environmental management programmes and others. […] And then of course the customer demands, so it comes from there, and stakeholder demands, so these considerations of sustainable development in all operations is demanded quite forcefully from all business partners. It comes from several directions. So that there really are no other options besides acting sustainably.*

Matters of social sustainability are also an important part of HM. The study programme has a strong value-based approach to the hospitality business, with respect for other people at the forefront:

> Interviewee B: Nyt kun meillä on tää tiimityöskentely ja valmentajuus mitä me käytetään, ni mä niinku näkisin siinä että tää meidän tapa opiskella, että niinku – / *We have this teamwork method and coaching that we use, and I view it so that there, that this our way of learning, is like –*
>
> Interviewee A: Se ihmisyys on siinä voimakkaasti esillä. Toisen ihmisen arvostaminen ja kunnioittaminen. / *Humanity comes through strongly there. Valuing and respecting the other person.*
>
> Interviewee B: Erilaisuuden hyväksyminen, ja sitten se että, että osataan toimia ja että erilaisia näkemyksiä, että miten niistä saadaan sitten se, yhteistä. / *Accepting diversity, and then that they are able to act, and that different viewpoints and how to build them into something shared.*

The interviewees said that health matters are present much throughout the course called "Superior's Responsibility for Quality and Safety," where among the topics are food hygiene, the ISO quality management systems, workplace wellbeing, occupational health and safety, and ergonomics. Furthermore, nutritional issues naturally make up a large part of the HM programme.

Instilling a sense of responsibility in the students in all their work is an important part of the study programme. The HM curriculum underwent an overhaul in 2013, and according to Interviewee B, the old curriculum had a separate study module where issues of social responsibility were covered. In the new curriculum she said this no longer remains disconnected from all the other teaching, but now the aspects of ethical and responsible action are taken into account in all the teaching. Partly this is a responsibility to co-workers, partly to potential employees, partly to customers:

> Interviewee B: Ja siitähän tulee taas se että, just sen hygienian kautta ja tän kaiken muun turvallisuuden ja raaka-aineen jäljitettävyyden elikkä se kuluttajanäkökulma siitä että kun asiakkaalle tehdään liiketoiminta, että asiakas maksaa niin et se esimies vastaa siitä että se palvelu on sitten eettisesti ja vastuullisesti tuotettu. / *And that leads to, through this hygiene and this safety and traceability, the consumer perspective of when we are doing business with a customer, and the customer is paying, then the manager is responsible for the service having been produced ethically and responsibly.*

Economic concerns are present much throughout the second year studies, according to the interviewees, with profitable business operations as a key issue. Economics are also a part of food waste management, since minimising waste in any business plays into cost-effectiveness.

An area where Interviewee B saw all three components of sustainability converging is when the purchase of ingredients according to its origins is being deliberated:

> Interviewee B: Siinähän tulee sit tää hintakysymys heti siihen se taloudellisuusnäkökulma sillä tavalla että onko se kannattavaa ja mistä näkökulmasta kannattavaa. Et jos sanotaan että et se raaka-aineen hinta […] asiakas on valmis maksamaan jotain, raaka-aine maksaa jotain, niin se et otetaanko sitä luomua vai lähiruokaa vai globaalia elintarviketta jostain tuolta että. Ja siinähän tulee myös kaikki nää eettiset asiat ja kuljetuskustannukset ja logistiset asiat. / *There is the matter of the price, the financial viewpoint, whether it is profitable and from which angle is it profitable. That if we say that the price of the ingredient […] the customer is ready to pay something, the ingredient costs something, then do we choose the organic or the local food, or the global foodstuff [originating] from somewhere out there. And that is where all these ethical issues and transportation costs and logistical matters come in.*

5.4.2 Pedagogies and learning outcomes in Hospitality Management

The HM study programme is strongly oriented towards learning by doing. The interviewees stated that learning environments are varied, from large lectures in auditoriums to teamwork in groups of ten or twenty people in the assignments at the catering studio. The teams are not allowed to remain the same throughout the year, but are required to switch members around. Conventional lecture-oriented teaching is uncommon:

> Interviewee A: Meillä ei oo kovin paljon semmosta perinteistä luokkaopetusta, niinku että opettaja puhuu ja, vaan että se on enemmänkin semmosta keskustelevampaa. / *We do not have much traditional classroom teaching, so that the teacher does all the talking. Instead it is more, like, conversational.*

When it comes to sustainable development, Interviewee B said that the object throughout the learning process in HM is to move from the level of abstraction to the level of concrete actions:

> Interviewee B: Että jos tän kestävän kehityksen näkökulmasta, niin sit meillä on semmonen että, että myös käytännössä tehdään että meiltä valmistunut restonomi osaa tehdä myös käytännössä että meillä on sitä, niin sillon se että mitä me puhutaan niin se meidän pitäis todeks näyttää sit meidän siinä tekemisessäkin. / *From the point of view of sustainable development, we have this that we do things in practice, that a graduate from our programme is able to act in practice, and the things we talk about we should be able to demonstrate in our actions, as well.*

She hoped that after moving into working life HM students would have the capabilities and the self-confidence to make changes in their field:

> Interviewee B: Että restonomi että valmistuttuaan että sillä olis pyrkimys ja kyky nähdä sillain, että viedä uusia toimintamalleja sinne kentälle. Et sehän on, että jos kehittämisen näkökulmasta, niin meidän toimialalla on vielä hirveen paljon tekemistä, niin se et mä itse haluaisin sen, että niillä olis se valmius ja hinku sitten toimia, tuoda sinne uusia käytäntöjä, ja kun sanotaan, että ei siellä töissä tehdä näin, mut että siis kun siinä on aina se muutosvastarinta siihen, että niin mut teiän pitäs nyt olla valmiita viemään sinne sit niitä uusia käytäntöjä. / *That our graduates would have the drive and the abilities to see and bring new models of action to the field. From a developmental point of view, we still have a lot to do in our field, and I would like to see [the students] having the readiness and the willingness to act, bring new practices there, and when it is said that they do not act like this at the workplace, but I mean there is always that resistance to change there, but you should be prepared now to bring the new practices there.*

Critical thinking is encouraged, and according to the interviewees, the students express their opinions and bring out their points of view liberally. They are not afraid to make suggestions even in the ways their teachers do their work, if they feel like there is something that should be changed:

> Interviewee B: Opiskelijat kyseenalaistaa tän meidän tavan toimia […] Tää että kuinka paljon ne haastaa meitä, niin siinä kohtaa ainakin, että et jos ne yhtä paljon haastaa siellä työkentällä toimialaa, niin kyllä ne väkisinkin kehittyy sitten ne asiat. / *The students question the way we act […] This how much they challenge us, then at least there is that if they challenge the [hospitality] industry as much out there in the field, then things are bound to improve.*

Multiculturalism is a significant component of HM. This is, at least partly, due to the demographic changes in Finland and the increasing number of immigrants, who will be customers, co-workers and employees to the students:

> Interviewee B: Kun meillä on nää ruoka- ja toimitilapalvelut niin siellähän kokoajan työntekijöissä tää monikulttuurisuus kasvaa että esimiehen pitää ymmärtää jo siinä omalla toimialallaan, että sulla on niinku – / *We have these food and facility services, and there the multiculturalism is growing, and so the manager has to understand in her own field that you have –*
>
> Interviewee A: Ja myöskin asiakkaissa. / *And also among customers.*
>
> Interviewee B: Asiakkaissa sitten se, että miten kohdataan ja miten nähdään ja mitä se tuo siihen palveluun mukaan. / *With customers there is the thing of how to connect with them, and how to see, and what it brings with it to the service.*

The students learn much about international food cultures. For example, they took part in the Aregala event in 2014, where chefs from sixteen different countries came to TAMK and the HM students worked as assistants at the workshops held by these chefs and arranged a food festival at the Kauppahalli market hall in Tampere (Tamperrada 2016).

Collaboration with other study programmes and with companies outside of TAMK are a part of project studies. Building on the social responsibility aspect of the study programme, the HM students are involved in the RestoBoost event where they invite young people to come and get acquainted with the hospitality management business (TAMK 2016b). The idea is to support the employment opportunities for young people, which is a part of the strong sense of social responsibility in the programme. Third year HM students also take part in Innoevent every year, where companies and organisations provide multidisciplinary student groups with cases to solve (Innoevent Tampere 2016). The interviewees also talked about a trip that the HM students had taken to a nursing home in

Goteborg, Sweden, along with students from the Social Services and the Music degree programmes. HM has collaborated with EEE in the annual Water Day event, as well as in waste management-related issues. Overall, the interviewees said that interdisciplinary collaboration is quite common but irregular.

In the real-life situations that the students will find themselves over the course of their studies, they will learn skills for collaboration and to manage conflicts:

> Interviewee B: Meillä on tosiaan että tiimityöskentely siellä käytössä ja me tehdään oikeita projekteja, niin siellähän tulee aidosti niitä tilanteita vastaan, […] kun ihmiset siellä touhuaa ja tekee niin siellähän tulee niinku luontaisesti semmosia ristiriitatilanteita. Niin siellähän joutuu just ihan, että, miten minä toimin, jos minun tää kunnioitus, et kun meidän arvoo, et kun kunnioitus toisia kohtaan, niin et sehän tulee kokoajan sitten niissä aidoissa tilanteissa punnitaan sitä. Että toiminko minä niin. / *We have the team working method in use there, and we do real projects, and so the real situations come up there, […] when people are bustling around and working there, so naturally conflicts arise. So there they have to [think about] how to act, whether this respect of mine, our values, respect for others is constantly being tested in these real situations. Whether I act this way or not.*

The interviewees thought that how well sustainable development is accepted in different degree programmes at TAMK is dependent on the values of the people in charge of these programmes:

> Interviewee A: Tietenkin se arvot edelleenkin voi olla se yks siinä ongelma että minkälaiset arvot kullakin on ja miten merkityksellisenä vastuullisuutta pidetään […] Tai se on ehkä henkilötasolla, ei niinkään koulutusohjelmassa, niin kaikillahan vastuullisuus tai kestävä kehitys ei oo arvo. TAMKissakaan. Sieltä se kai sitten lähtee että opettajat olis sitoutuneita. / *Of course the values can still be one of the problems, what kind of values each person has and how important a sense of responsibility is regarded as […] Or then it is maybe on a personal level, not so much in the study programme, everyone does not hold a sense of responsibility or sustainable development as values. Even in TAMK. I think that is where it begins, from the teachers being committed.*

5.5 Summary of interview findings

What connects all the four degree programmes examined for this thesis is the fact that they all have aspects of sustainable development present, but for the most part these remain invisible. Interviewees from all the programmes were of the opinion that many of the sustainability considerations that came up were an inseparable part of their programme, but often they had not conceptualised these issues as being a part of sustainable development. It follows, then, that students are also not made aware of this connection.

Of the three dimensions of sustainable development, environmental concerns are the most prevalent in all four programmes, taken into consideration in much of what is being taught. In BSE the predominant environmental issue is energy efficiency, in ME material recyclability and energy production-related matters, and in HM food waste and water usage reduction. In EEE, due to the nature of the programme, several environmental issues are prominent with none of them rising to the forefront above the others.

From the social dimension, occupational health and safety issues are found in all four programmes. In the fields of both BSE and ME professionals are involved in creating electrical or mechanical systems for use by other people, so they have to ensure the safety of these constructions. In HM this similar type of responsibility extending to customers is related to food safety. Economic aspects are the most relevant in HM, because entrepreneurial and business studies form a part of the programme. The curricula of the other three programmes have one course each explicitly dealing with economic topics.

Explicit sustainable development-related course content is found in BSE in a three-course study module, in ME as a part of a larger study module done in cooperation with TUT, and in EEE on a number of courses. The interviewees were able to identify some topics taught on other courses that combined more than one of the three aspects of sustainable development, but for the most part these considerations remained separate.

As the only non-engineering programme studied for this thesis, HM stands out in its humane approach to the field. A sense of responsibility and respect for fellow human beings was emphasised by the interviewees to a much larger extent than by the interviewees in the other programmes. In BSE this need to take responsibility for one's own actions came up in the context of work safety, and the EEE curriculum contains a course covering the topic of environmental ethics.

All four programmes feature much collaborative work, either within the study programme, with other study programmes, or with companies and organisations outside of TAMK. In ME and HM the minority of all work is done individually. Projects are done with outsiders and in real situations by all programmes, although less in EEE than in the others. Multicultural collaboration is the most evident in HM, where getting to know international food cultures forms a large part of the studies. Multiculturalism is also an inherent part of EEE, where the teaching language is English, and which therefore receives many foreign students every year.

In BSE there is a need to stay up-to-date with changes in the field and to look forwards at future changes. In HM futures thinking is present as the need to keep improving and developing the hospitality industry, and in EEE as a part of the deliberation of long-term environmental issues. Environmental issues furthermore make systems thinking an inseparable part of EEE, because of the expansive connections that exist between and within ecosystems. One of the interviewees in ME surmised that systems thinking is essential to any engineering work, and this indeed came up in the BSE interview as well, where students have to learn to think of the whole of the built environment.

Critical thinking skills are exercised to some degree in all the four programmes, and all interviewees expressed a positive opinion of a conversational or even argumentative study method. In BSE and EEE students are expected to reflect on the things they have learned by examining their own life and their own behaviour. In HM there is a strong presence of learning by doing, where students have to be able to put principles and theory into practice.

The central findings from the interviews are summarised in table 1.

Table 2. Central interview findings on the learning content, pedagogies, and learning outcomes of the four study programmes.

Programme	Learning content			Pedagogy			Learning outcomes		
	Environ-ment	Social	Economic	Interdisci-plinarity	Collabora-tion	Learning through do-ing	Critical thinking	Systems thinking	Futures thinking
Building Services Engineering	Energy effi-ciency, life cycle analy-sis, recy-cling, car-bon foot-print	Occupa-tional health and safety, health re-lated to built envi-ronment	Energy effi-ciency, a variety of topics cov-ered on a single course	Projects with other engineering programmes	Projects with compa-nies, team work in courses	Project work, using TAMK as a real-life learning en-vironment, investiga-tive learning technique	Looking at one's own habits through what has been learned	Understand-ing the building as a part of the infrastruc-ture	Anticipating upcoming legislative and techno-logical changes in the building trade
Mechanical Engineering	Energy pro-duction, biofuels, emission calculations, recycling, material ef-ficiency, sustainable production	Occupa-tional health and safety, design of safe ma-chinery	A variety of topics cov-ered on a single course	Projects with other engineering programmes	Projects, most course work done in groups	Project work	Debating, teachers presenting provocative statements	Each new subject mat-ter pre-sented as a part of a whole	--

Energy and Environmental Engineering	Wide array of environmental topics	Occupational health and safety, public participation, health issues in courses dealing with pollution and emissions	A variety of topics covered on a single course	Overlap between courses, collaboration with other engineers in the project study module	Group work within courses	A project study module, laboratories	Discussion and comments in class encouraged, reflection on one's own life	Essential to environmental concerns: the environment a web of interconnections	Essential to environmental concerns: environmental challenges long-term
Hospitality Management	Food waste management, energy and water consumption	A sense of social responsibility, occupational health and safety, food hygiene, ergonomics, nutritional matters	Form a large part of second-year studies	Projects with other study programmes quite common but irregular, taking part in Innoevent	Group work at the catering studio	Practical work emphasised, an aim to move from the level of abstraction to concrete actions	Comments, expression of opinions, feedback encouraged	--	The need to bring changes into the hospitality industry

6 DISCUSSION

A common point that came up in the interviews again and again was that even though themes of sustainable development can be found in the course contents as well as in practical course work, the term itself is not often used. It is an underlying presence rather than an overarching framework. Even some of the teachers interviewed were surprised at realising how many topics in their courses were sustainability-related. Sustainable development should not be taught as a separate subject, but its principles should be embedded in every other subject (UNESCO 2005, 18). In this way at least, these four study programmes in TAMK seem to be well under way. The interviewees averred that in their programmes the environmental perspectives – whether it be energy efficiency, material recyclability or waste reduction – are so integral as to be self-evident. Students are expected to take these considerations into account while engaging in practical coursework, which adheres to the learning-by-doing principle of ESD.

At the same time, ESD calls for its values to be made explicit (UNESCO 2005, 18). Students may learn of sustainability-related topics even without becoming aware that this is indeed what they are, but as long as sustainability remains an unspoken theme, its components separate and scattered over several courses, students are unlikely to be able to critically begin examine themselves and the world around them from the perspective of making more sustainable choices. The process of ESD remains only half-finished.

The interviewees speculated that students who are not in “green” study programmes such as EEE may be reluctant to accept sustainable development content in their courses if they do not expect it to be there. This is likely due to a misunderstanding of what sustainable development actually entails – reducing the whole to only its environmental component – as well as a part of a larger societal mind-set where environmental concerns can be dismissed as ideology, a domain of the few, or even hysteria. Although students may acknowledge environmental considerations – such as energy efficiency – as par for course in their field, they may frame these issues from a non-environmental perspective, for example an economic one. There is no necessity for them to shape their self-image towards a “tree hugger.”

The purpose of ESD is to hasten the shaping of this larger societal mind-set into one where sustainability concerns are paramount to everyone, in all sectors of society

(UNESCO 2014, 12). To help students accept sustainable development-related content in their studies, and to eventually be a part of the process of transformation, this content should be made more evident. If TAMK acquires a reputation as a HEI with a mission of promoting sustainability – including environmental responsibility as well as a strong sense of social justice – incoming students will know what to expect even before they have taken a single course. It is then a positive sign in this direction that the curricula even in engineering programmes such as ME will be updated in 2016 to make room for more sustainability.

It is reasonable to assume that the attitude of the teachers towards topics of sustainable development would make a large difference in whether or not his or her students are willing to internalise the fundamentals of ESD. On the basis of the interviews conducted for this thesis, teachers at TAMK seem to have a generally positive attitude towards sustainability. Of course, the sample group for this thesis was somewhat self-selecting, because it is likely that the teachers who agreed to be interviewed already were positively inclined towards discussing the matter. In addition, these four study programmes examined only consist a small fraction of all the programmes in TAMK, and do not give a particularly diverse view, because three of the four were engineering programmes. Nevertheless, the fact that sustainable development is included in the values on the organisational level at TAMK, as well as in the public Commitment 2050 declaration, would suggest that at least a majority of the staff at the university would be amenable to the principles of sustainability.

ESD necessitates a strong value basis for education, including respect for all humans, respect for the natural environment, and a desire to establish a tolerant, peaceful, and a non-violent society (UNESCO 2005, 18). This aspect was not addressed by the questions asked from the interviewees, but it came up spontaneously in a few interviews, most notably in the one with the HM teachers. They underscored the need for HM students to have respect for their fellow human beings and acceptance of individual differences. These very human values may not arise as strongly in the engineering programmes, which deal more with systems, either living or non-living, and less with people. However, in the BSE interview the interviewee touched upon the sense of responsibility that her students have to have for their co-workers. Furthermore, it is reasonable to assume that in the EEE programme environmental values would be a part of the studies.

All of the teachers interviewed found that they employed at least some of the teaching methods entailed by ESD. Group learning (UNESCO 2005, 22) was employed the most, with students expected to work on many assignments in teams rather than individually. Much of the collaboration is done within projects, often with people outside of TAMK. Project works and collaboration with companies and communities outside the HEI is perhaps characteristic to universities of applied sciences such as TAMK, because the orientation of this type of education is towards building practical career skills and networking. Local relevance of studies called for by the tenets of ESD (UNESCO 2005, 18) could be said to be a part of the local companies and organisations giving TAMK students cases and projects that are relevant for them.

Sometimes the teams for the projects that the students engage in are interdisciplinary – a key component of ESD (UNESCO 2005, 18) – in that they combine students from different study programmes in TAMK. Even then it seems that the fields of expertise remain quite narrow – for example, engineers from one study programme are often collaborating with engineers from another. Exception is made by happenings such as Innoevent, held annually at TAMK, where the student groups tackling cases are often wildly interdisciplinary. They will have to combine their forces to solve problems and thus possibly learn skills for future sustainable development-related problem solving in the process. Organising more projects like this for the students to take part in would be beneficial in building their collaborative skills that transcend the boundaries between disciplines.

Project work also entails active and interactive learning, which is another part of ESD (UNESCO 2014, 12). The idea is to move from principles and ideals to concrete action, in the vein of transformative learning, which brings about new and dynamic ways of seeing and doing. Of the four study programmes examined, HM had the strongest orientation in this direction. The interviewees spoke of this in the context of the students being the future shapers and transformers of the hospitality industry, but it is not unreasonable to think that this same mode of action could be expanded to the society at large.

The extent to which the students are encouraged to hone the other core competencies of ESD – critical thinking, futures thinking, systems thinking skills (UNESCO 2005, 18; UNESCO 2014, 12) – remains vague. This type of teaching content is perhaps not even very well recognised by the teachers themselves, at least not in an interviewing situation without first given the chance to reflect on it for some time. However, all the interviewees asserted that they are happy to promote discussion and receive comments in class, and

more than one interviewee claimed that systems thinking and futures thinking are an essential part of their field in particular.

How well the students at TAMK have absorbed the essence of ESD – the topics as well as the models of action and thought – would have to be monitored over a longer time, perhaps by employing participative exercises like one of the interviewees in EEE did, or through writing exercises, essays or theses. Ultimately, if their education at TAMK has succeeded at making students more aware and more active in bringing about the societal transformation ESD aims for, the results will not show in full until years later, after they have graduated and started on their careers.

7 CONCLUSIONS

Making sustainability a more visible component of all teaching activities in TAMK would be a significant way of helping the successful achievement of the goals of ESD along. Sustainable development is already stated as one of the values at TAMK, and there is no reason why it should not be unambiguously present in course contents. Branding TAMK as a higher educational institution that takes into account environmental, social as well as economic values in all operations, being on the forefront of this wave, is likely to pay off in the not-too-distant future.

The inferences I have made about the nature of the four degree programmes examined are, naturally, much dependent on the interviewees. Although the curricula of the programmes contain general descriptions of the course contents, pedagogies and the ESD specific learning outcomes are not included in there, and so I relied mostly on the interviewees to give me information on these issues. Had I interviewed a different set of teachers, I might have arrived at very different conclusions. More than one interviewee pointed this out as well – the degree to which the goals of ESD will be met is dependent on the attitude of the teacher. But, as became evident over the course of the interviews, students play a large part in this, too. The students at HEIs are young adults who have already formed much of their worldview. If they come to TAMK knowing in advance that sustainability concerns will be present in all of their studies, they will be more open to ESD and all that it entails, and will be able to incorporate sustainability values as a part of their professional identity.

Interviewing is a skill that has to be learned – before beginning a project employing the interview method, it is common for researchers to be trained. I received no training before starting work on this thesis, and had never done any similar type of research before. Not before I was listening to the recordings of the interviews did I realise all the additional questions I should have asked to better understand what the interviewees were saying, as well as the clarifications I should have made to the questions I did pose. I do not think I got to the heart of the matter as efficiently as a more experienced interviewer probably would have. The amount of information I did glean through the interviews was mostly thanks to the patience and expertise of my interviewees. Time permitting, I also would have liked to interview teachers from a business-oriented programme, to include more economic viewpoints. As such, this dimension of sustainability remained a rather small part of the thesis.

As a part of my interview questions I asked the teachers to estimate how well they thought their students had absorbed the principles of sustainable development through their studies at TAMK. I always qualified this question with the comment of, “Of course, I should be asking this from the students themselves.” As a further study it would be, indeed, interesting to map how sustainability literate students are. Furthermore, since this thesis only examined four of the over forty degree programmes at TAMK, even in the form of additional teacher interviews there would still be much more ground to cover.

REFERENCES

Asikainen, E. Hellman, S., Parjanen, L., Puputti, M., Raatikainen, S. & Schroderus, M. (forthcoming). Unipoli Green - Four Universities Working Together for Sustainability. In Leal Filho, W., Mifsud, M., Pretorius, R. & Shiel, C. (eds). Handbook of Theory and Practice of Sustainable Development in Higher Education. Springer.

BUP. N.d. About Keke Forum. Read 21 April, 2016. http://www.bup.fi/index.php/keke-foorum/about-keke-forum

Cohen, D. & Crabtree, B. July 2006. Qualitative Research Guidelines Project. Read 29 April, 2016. http://www.qualres.org/HomeSemi-3629.html

Dawe, G., Jucker, R. & Martin, S. 2005. Sustainable Development in Higher Education: Current Practice and Future Developments. A report for The Higher Education Academy. Read 6 April, 2016. https://www.heacademy.ac.uk/sites/default/files/sustdevinhefinalreport.pdf

Degree Programme in Building Services Engineering. 2016. ECTS Study Guide. Tampere University of Applied Sciences. Read 3 May, 2016. http://opinto-opas-ops.tamk.fi/index.php/en/167/en/49581

Degree Programme in Energy and Environmental Engineering. 2016. ECTS Study Guide. Tampere University of Applied Sciences. Read 5 May, 2016. http://opinto-opas-ops.tamk.fi/index.php/en/167/en/49534

Degree Programme in Hospitality Management. 2016. ECTS Study Guide. Tampere University of Applied Sciences. Read 6 May, 2016. http://opinto-opas-ops.tamk.fi/index.php/en/167/en/49589

Degree Programme in Mechanical Engineering. 2016. ECTS Study Guide. Tampere University of Applied Sciences. Read 4 May, 2016. http://opinto-opas-ops.tamk.fi/index.php/en/167/en/49529

Desha, C. & Hargroves, K. 2014. Higher Education and Sustainable Development: A model for curriculum renewal. London: Routledge.

Drexhage, J. & Murphy, D. 2010. Sustainable Development: From Brundtland to Rio 2012. Background Paper – prepared for consideration by the High Level Panel on Global Sustainability at its first meeting, 19 September 2010. New York.

Education and Research 2011-2016: A development plan. 2012. Reports of the Ministry of Education and Culture, Finland 2012:3.

Global Footprint Network. 2016. Ecological Wealth of Nations. Read 8 April, 2016. http://www.footprintnetwork.org/ecological_footprint_nations/ecological_per_capita.html

Hirsjärvi, S. & Hurme, H. 2001. Tutkimushaastattelu: Teemahaastattelun teoria ja käytäntö. Helsinki: University Press.

Holm, T. 2014. Enabling change in universities: Enhancing education for sustainable development with tools for quality assurance. University of Turku. Department of Biology. Environmental Science. Doctoral thesis.

Innoevent Tampere. 2016. About. Read 7 May, 2016. http://innoevent.fi/about/

Jones, P., Selby, D. & Sterling, S. 2010. More than the Sum of their Parts? In Jones, P., Selby, D. & Sterling, S. (ed.) Sustainability Education: Perspectives and Practice Across Higher Education. London: Earthscan.

Kalliomäki, A. 2007. Higher Education for Sustainable Development – International and National Guidelines. In Kaivola, T. & Rohweder, L. (eds.) Towards Sustainable Development in Higher Education – Reflections. Publications of the Ministry of Education, Finland 2007:6. Helsinki: University Press, 14–17.

Klein, J. T. 2004. Interdisciplinarity and complexity: An evolving relationship. E:CO 6 (1-2), 2–10.

Martin, S. & Jucker, R. 2003. Educating Earth-Literate Leaders. Keynote speech. International Conference on Education for a Sustainable Future. Shaping the Practical Role of Higher Education for a Sustainable Development. September 10-11, 2003. Prague.

Matilainen, M. 2014. Siivoustyön kehittäminen Campusravita oy:ssä: Esivalmisteltu siivous. Palvelujen tuottamisen ja johtamisen koulutusohjelma. Tampereen ammattikorkeakoulu. Opinnäytetyö.

Matthew, R. A. & Hammill, A. 2009. Sustainable development and climate change. International Affairs 85 (6), 1117–1128.

McKeown, R., Hopkins, C. A., Rizzi, R. & Chrystalbridge, M. October 2006. Education for Sustainable Development Toolkit. Education for Sustainable Development in Action Learning & Training Tools N°1. Paris: UNESCO.

OECD Better Life Index. Finland. Read 4 April, 2016 http://www.oecdbetterlifeindex.org/countries/finland/

Pirkanmaan Protopaja-pilotointi loppuselvitys. December 2013. Avoin Tampere. Read 5 May, 2016. http://www.avointampere.fi/site/assets/files/1002/avoin_tampere_pirkanmaahwekosysteemi_loppuselvitys121213.pdf

Rohweder, L. 2008. Kestävä kehitys koulutuksen päämääräksi. In Rohweder, L. & Virtanen, A. (eds.) Kohti kestävää kehitystä. Pedagoginen lähestymistapa. Opetusministeriön julkaisuja 2008:3. Helsinki: Yliopistopaino, 18–23.

Rydén, L. 2007. The Value Base of Sustainable Development. In Kaivola, T. & Rohweder, L. (eds.) Towards Sustainable Development in Higher Education – Reflections. Publications of the Ministry of Education, Finland 2007:6. Helsinki: University Press, 28–34.

Sachs, J. D. 2015. The Age of Sustainable Development. New York: Columbia University Press.

Sterling, S. 2004a. An analysis of the development of sustainability education internationally: Evolution, interpretation and transformative potential. In Blewitt, J. & Cullingford, C. (eds.) The Sustainability Curriculum: The Challenge of Higher Education. London: Earthscan, 43–62.

Sterling, S. 2004b. Systemic thinking. In Tilbury, D. & Wortman, D. (eds.) Engaging people in sustainability. Commission on Education and Communication. International Union for Conservation of Nature and Natural Resources. Cambridge: IUCN, 77– 93.

Sustainable development in education: Implementation of Baltic 21E -programme and Finnish strategy for the Decade of Education for Sustainable Development (2005-2014). 2006. Reports of the Ministry of Education, Finland 2006:7. Helsinki: University Press.

TAMK. 18 February 2016a. Talotekniikan neuvontaklinikka: Ratkaisuja asiakkaan remonttikohteisiin. Read 3 May, 2016. http://www.tamk.fi/web/tamk/-/talotekniikan-neuvontaklinikka-ratkaisuja-asiakkaan-remonttikohteisiin

TAMK. 2016b. RestoBoost – työelämäni verkostot. Read 7 May, 2016. http://www.tamk.fi/-/restoboost-tyoelamani-verkostot

TAMKin strategia – kohti vuotta 2020. 12 February, 2016. Tampere University of Applied Sciences. Read 21 April, 2016. http://www.tamk.fi/documents/10181/45809/TAMKin+strategia_2016.pdf/56aa380d-71df-450f-84f0-5f432ce7b324

Tampereen ammattikorkeakoulun Kestävän kehityksen toimintaohjelma. Kestävän kehityksen työryhmän ehdotus. June 2012.

Tampereen ammattikorkekoulun yhteiskuntasitoumus. 29 September, 2015. Sitoumus 2050. Read 21 April, 2016. https://sitoumus2050.fi/commitment/tampereen-ammattikorkeakoulun-yhteiskuntasitoumus-1

Tamperrada. 2016. Aregala – kansainvälinen gastronomiatapahtuma Tampereella. Read 7 May, 2016. http://www.tamperrada.fi/aregala/

Tilbury, D. & Mulà, I. 2009. A Review of Education for Sustainable Development Policies from a Cultural Diversity and Intercultural Dialogue Perspective. Identifying Opportunities for Future Action. Paris: UNESCO.

Transforming Our World: The 2030 Agenda for Sustainable Development. A/RES/70/1. 2015. United Nations General Assembly resolution 70/1.

TUT. 14 April, 2015. Kestävä tuotanto, 25 op. Opinto-opas 2015-2016. Read 4 May, 2016. http://www.tut.fi/wwwoppaat/opas2015-2016/perus/opintokokonaisuudet/Aineopinnot-Kestava_tuotanto-25.html

UNESCO. 2005. United Nations Decade of Education for Sustainable Development (2005-2014): Draft International Implementation Scheme. Paris.

UNESCO. 2014. Roadmap for Implementing the Global Action Programme on Education for Sustainable Development. Paris.

UNESCO. 2016. Sustainable Development. Read April 14, 2016. http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/sustainable-development/

UTA. 31 January, 2013. Integrating Sustainable Development into the Curricula at the University of Tampere: Overview of Implementation. Read 21 April, 2016. http://www.uta.fi/opiskelu/kestavakehitys/esdan/index/ESDAN_Report4_University%20of%20Tampere.pdf

Wals, A. E. J. & Blewitt, J. 2010. Third-wave Sustainability in Higher Education. In Jones, P., Selby, D. & Sterling, S. (eds.) Sustainability Education: Perspectives and Practice Across Higher Education. London: Earthscan.

WCED. 1987. Report of the World Commission on Environment and Development: Our Common Future. Read 21 March, 2016. http://www.un-documents.net/our-common-future.pdf

Wyness, L. & Sterling, S. 2015. Reviewing the incidence and status of sustainability in degree programmes at Plymouth University. International Journal of Sustainability in Higher Education 16 (2), 237–250.

Ympäristöosaava. N.d. Ruokapalveluala. Read 6 May, 2016. http://www.ymparistoosaava.fi/ruokapalveluala

APPENDICES

Appendix 1. The interview outline used for data acquisition, translated from the original Finnish questions

1. Introductory questions
    a. Who are you?
    b. What type of things do your duties at TAMK include?

2. How would you define the term ”sustainable development?”

3. Do you have any courses that have as topics:
    a. Environmental sustainability: natural resources management; food & agriculture; ecological systems; waste/water/energy; biodiversity; climate change; ecosystem services
    b. Economic sustainability: corporate social responsibility; consumerism; globalisation of economy; accountability and ethics; international development
    c. Social sustainability: sustainable communities; cultural diversity/multiculturalism; intercultural understanding; travel, transport and mobility; health and wellbeing; peace, security and conflict; citizenship, government and democracy; human rights

4. (If the courses I found don’t come up, ask specific questions about them and their topics)

5. Any courses that combine more than one aspect of sustainability?

6. Are any of the following pedagogical approaches implemented in any courses: critical reflection, systemic thinking and analysis, participatory learning, futures thinking, collaborative learning, or interdisciplinarity?

7. What type of learning outcomes are expected of students?

8. Has student feedback reflected the achievement of the learning goals set for the course?

9. What, if any, obstacles do you see in the way of integrating sustainable development in the curricula at TAMK?