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EDUCATION FOR SUSTAINABLE DEVELOPMENT AND THE RELATION TO LEARNING FOR ENTREPRENEURSHIP IN THE NATIONAL TECHNOLOGY PROGRAMME IN THE SWEDISH UPPER SECONDARY SCHOOL – IS IT A "HAPPY COUPLE"?

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ABSTRACT

The last decades have seen a grooving insight in the need of development towards a sustainable society. This manifests in several political statements but also reveals the problem with realization. In this study we investigate how the concept of education in sustainable development is presented in steering documents for the Swedish upper secondary school and especially the national technology programme. This choice of programme is made because its content easily can be connected to the three categories in sustainable development: environment, social and economic issues. Another perspective that has became current in the educational system in Sweden and also manifested in political documents is Entrepreneurship. Inspired by both discourse analysis and by Bourdieu's theories about social practices in society we have studied the Swedish national steering documents for the technology programme out from writings of sustainable development and entrepreneurship. The result is remarkable in that even if writings about sustainable development exist, they get more diminished and less committing the closer you get to the actual teaching situation. In documents, that steer and signals especial values for teaching in the programme, we find interesting diverges in statements. Sustainable development seems to be valued lower compared with for example entrepreneurship and product development for economic growth. Both sustainable development and entrepreneurship are highlighted in the steering documents and a political aim is to connect them, but it is interesting to see how different they are emphasized in the different documents especially in the more concrete course syllabi. One

conclusion can be that Sweden on an international level has ambitions to be seen as a nation taking responsibility for the future but has not been able to transmit this into action in the educational system.

1. Introduction

The project aims to study what happens in the technology programme in upper secondary school in Sweden when the concepts of sustainable development and entrepreneurship will be constructed within a specific school practice. This article presents the results of the first part of this project. Focus is on the steering documents related to the technology programme where the use of the concept of sustainable development and the concept of entrepreneurship are investigated.

1.1. Background

Both the Swedish industry and The Swedish National Agency for Education highlights the shortage of engineers in the future and the need for an increased interest in technology, sustainable development and entrepreneurship (The Technology Delegation, 2010; The Swedish National Agency for Education, 2010). The school results in science and technology dip for Sweden (PISA, 2009), which is problematized (The Swedish National Agency for Education, 2009) after completion of the TIMSS tests. There is a low interest in technology (ROSE, 2011) among young people. One consequence is that relatively few students apply to the technology programme in upper secondary school and to higher education in technology. The technology programme has an important role to play when giving young people with interest for engineering and technology an inspiring ground for higher education and for working in the technology sector with an entrepreneurial approach with issues for the future related to sustainable development.

Here we focus on the technology programme in upper secondary school and the new steering documents that were implemented in the programme during autumn 2011. In these documents we especially review formulations about sustainable development and entrepreneurship which are seen as important content and though should have a strong impact in the programme.

1.1.1. The Technology Programme in Sweden

"The Technology Programme is a higher education preparatory programme. With a diploma from the programme, students should have the knowledge needed for higher education studies primarily in technology and the natural sciences, as well as other areas"[1]. Sweden needs competence in technology for sustainable development and engineers with an entrepreneurial approach (The Technology Delegation, 2010). In higher education, at the university, various engineering programs have different identity markers, status and self-images which are supplied by students and staff in programs that affect students who choose and students' identity formation (Andersson & Linder, 2010; Stonyer, 2002). This also affects values and statements in the upper secondary school. The engineering programs at universities have close relationships in certain aspects, to the technology programme in upper secondary school. Earlier research shows why students choose a specific programme, for example the technology programs in upper secondary school, and how young people create their identity. The choice of life paths is a choice of identity, especially with education (Schreiner& Sjöberg, 2007; Schreiner, 2006; Reid et al, 2008). Studies also shows how education gives the individual opportunity to learn and get skills that can affect values, habits and roles in society (Haveman & Wolfe, 1984). A choice of the technology programme gives students specific skills and values. All students in Sweden are expected to choose their programme freely and the career is not "given" as in the past. But what does "choose freely" means and what conditions (cultural and social capital) requires (Bourdieu, 1986) for a free choice? The technology programme in Sweden is characterized by strong male dominance and by students from homes with less educational resources, and homes where economic capital outweigh culturally capital (Lidegran et al, 2006; Broady et al, 2000). The programme has sunk in the social hierarchy (Broady & Börjesson, 2008).

Fröberg (2010) shows in her thesis that a "perfect" student at the technology programme in Sweden, constructed in the opinions of teachers, is a male student with a genuine interest of "traditional" technology. On the political level the intention is to create a technology programme that attracts more female students and the strategy that has developed is to present a modern technology programme with a broader entrance with different specializations (Fröberg, 2010). Specializations as energy, environmental and design etc. and different teaching and working methods such as problem solving based and putting technology in contexts have been framed. But Fröberg describes how the teachers active at the technology

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[1]Citated from homepage: http://www.skolverket.se/forskola-och-skola/gymnasieutbildning/program/nationella-program/teknikprogrammet

programme are narrowing the concept of technology. "True" technology, "soft" technology and "less technical" technology are examples of how teachers on the programme are describing and classify different areas. When it comes to the way out from the programme, the political intention is to see the programme both as a foundation for higher education and that it has a professional role, forming a technical worker. Here Fröberg (2010) can see how teachers on the programme focus on how the programme mostly will be seen as a ground for higher education. But even if the teachers emphasis the programme as a ground for higher education they highlight the importance of practical skills and a genuine traditional technical interest, mostly found among male students. The aims with the technology programme are partly based on the CDIO-concept, a frame for engineering education. *Concieve* (to find or think of something), *Design* (constructing), *Implement* (implement, realize), *Operate* (use, in service), the hole chain from idea to using a product (CDIO-initiative, 2012; Gunnarsson, 2011) that describe a typical creative engineering process.

There is a translation from the political level to the operative level, how the specific school implements a course, through the operationalized corresponding authority level, The Swedish National Agency for Education. Fröberg (2010) finds how a political directive is converted from intentions with a programme for more female students to a traditional technology programme mostly for male students with a genuine technical and traditional engineering interest.

In this study we investigate how political intentions and directives, Education Act and the steering documents early in *the steering chain*, eventually is transformed when they come down to more concrete steering documents such as course syllabus in which teachers and other actors have been involved. We will focus on intentions with sustainable development and entrepreneurship, concepts that both are emphases at the political level in documents.

1.1.2. *Sustainable development and entrepreneurship in secondary school in Sweden*

In the autumn of 2011 the teaching started with a new programme structure and new curricula for the technology programme in upper secondary school. For the diploma goals in the programme it is said:

> "The education should develop students' knowledge of and skills in technology and technological development. It should also highlight the role of technology in the interaction between people and nature with regard to sustainable development".

The Swedish Government appointed as early as 2003 a committee on education for *sustainable development*. This committee stated the importance of the whole education system on achieving sustainable development:

"Developments in society, combined with the knowledge that the present generation bears the responsibility for ensuring that future generations in every country in the world will be able to meet their needs, demand immediate vigorous measures. Learning is a prerequisite if mankind is to be able to meet the challenges facing the world. What people learn and how they put it into practice is crucial for whether sustainable development can be achieved" (SOU 2004:104, p. 19).

This was further developed in a Government Communication (2005/06:126, p. 71) where it is stated that a sustainable development perspective must permeate all education in Sweden. In the autumn of 2011 the teaching in the whole upper secondary school started under a new curriculum:

> "Environmental perspective in teaching should provide students with insights so that they can help to prevent negative environmental impact, but also develop a personalized approach to targets and global environmental issues. The education will highlight how society functions and the way we live and work can be adapted to create sustainable development. It is the responsibility of the school that each student can observe and analyze human interaction with their environment from the perspective of sustainable development" (Translated by the author, SKOLFS 2011:144).

Such teaching means, among other things, that the subject content is taught with an interdisciplinary approach (Öhman, 2003) and that a personal 'action competence' has to be developed (Sellgren et al., 2007). This includes both the knowledge and the will to influence a sustainable development. It should therefore be an overall aim in education for sustainable development that students acquire the ability and the will to work for sustainable progress both locally and globally which means giving students the chance and the power to act for a better environment. Students will be encouraged in critical thinking and reflections (UN,

2003). Education for sustainable development is in its nature interdisciplinary and therefore teaching:

> "demands a reorientation away from focusing entirely on providing knowledge towards dealing with problems and identifying possible solutions. Therefore, education should retain its traditional focus on individual subjects and at the same time open the door to multi- and interdisciplinary examination of reallife situations" (UNECE 2005, p.30)

The political mission with *entrepreneurship* could be summarized as: self-employment and enterprise is important and must be a natural choice as well as employment and students needs knowledge, skills and approaches for that. An entrepreneur is a person that is a creative expert on problem solving and interested of thinking new, good at planning, characterized by responsibility and good at cooperating with others. Therefore entrepreneurship has to follow the programmes in secondary school like a red thread (Government offices of Sweden, 2009). Entrepreneurship in school should be seen as a pedagogical approach as much as knowing how to create business. Karlsson (2009) describes entrepreneurship in school as four parts; "for", "in", "through" and "about" entrepreneurship. Teaching "in" entrepreneurship requires that the student is active in any way and learn "through" and "for" entrepreneurship. Teaching "about" means that the students will have an understanding about an entrepreneurial process (Landström, 2005; Leffler, 2006) and an understanding about, insight in the entrepreneurs thinking and acting (Karlsson, 2009). Teaching "in" will be theoretical but also practical, it will promote innovative acting (Karlsson, 2009). The aim with entrepreneurship in school often is to stimulate business thinking (Landström, 2005; Leffler, 2006) but it is also very similar to that Peterson and Westlund (2007) describe as "entrepreneurial spirit", a person who is creative, constructive, innovative and have the ability "to get things done".

Sarasvathy (2001) describes entrepreneurship in school more as an approach, a way you can relate to the environs, she introduce the concepts *effectuation* and *causation* and see them as two ways in which we can relate to a situation. *Effectuation*; one base a process on existing resources and thus choose different effects (metaphor: *open the refrigerator and make a dinner from the content*) and *Causation;* as everything is possible to arrange and you know the effect (*one follow the recipe*)). *Effectuation* could also be understood as how can we create something with resources that we already have, learning the students to navigate from the position they have instead of giving students lots of entrepreneur characteristic that they

expect to learn, students have already a lot of experimental lust (Berglund & Holmgren, 2007; Holmgren, 2007).

In Sweden the technology programme in the upper secondary school has a specific focus on sustainable development and entrepreneurship that is emphasized in the curriculum and other governing documents. The guidelines also emphasize that the specifically education for sustainable development and the learning for entrepreneurship have to be combined in education (Ottosson, 2012; Government offices of Sweden, 2009), all with aim to get an economical grown based in technology for sustainable development. Therefore it's interesting to investigate how sustainable development and entrepreneurship is described in steering documents on different levels, at "the top" in political statements and in "the bottom" in concrete course documents. Are they a combined "happy" couple or..?

1.2.   Theoretical background

Previous research has shown that upper secondary school teachers choose different approaches to involve more evaluative topic content with a focus to reach understanding of sustainable development or involving technology optimism and entrepreneurship in the subject matter (for example in physics subject, described by Engström, 2011, Engström, Gustafsson & Niedderer, 2011; Engström & Gustafsson, 2010). These strategies and choices among other things can be linked to the teachers' habitus (habitus defined by Bourdieu, 1996a) but it seems to be important how and what the steering document signals (Engström, 2011). The steering documents are created on different levels with different degree of concretizing and they are not only formal national steering documents guiding the daily work in the school, they can at the same time be seen as a set of dominant ideas in society organizing knowledge that the school will communicate and transform (Lundgren, 1992). Curriculum must not only be seen as "fact" with aims, knowledge and skills that will be mediated to the students. Curriculum could also be seen as a "practice" focused on "understanding the historical emergence and persistence of particular perceptions, of knowledge and particular conventions (school subjects for example)" (Young & Whitty, 1977, p. 58). According to Young knowledge is only "socio-historical constructions". Here we relate to Bourdieu (1996) and a theory of a social practice with structures and if we want

to understand the structures we have to investigate high valued activities, values, statements etc. in that practice.

In this study we choose a perspective that perceives and understands steering documents as a part of a social practice and as "texts holding contradictions and ambivalences that maintain certain language games and discursive hegemonies" (a poststructuralistic perspective according to Sundberg, 2007 s. 28) that assume to maintain certain political, social and economical conditions in society. The texts are privileged and have to be understood in their concealing of consensus. Therefore we are interested in analyzing the texts, the steering documents, with a ground in Bourdieu's theory of a social practice with aim to understand underlying structures and we see upon the texts as reflections and reproducers of both conscious and unconscious beliefs that individuals that have created the texts hold (Bergström & Boreus, 2010).

1.3. Research questions

The technology programme represents a school practice, a social practice (Bourdieu, 1996) and in this study we focus on how the steering documents in this social practice signals the content and the approach related to sustainable development and to entrepreneurship. What themes are revealed? How are different purports of sustainable development and entrepreneurship valued in relation to each other? What beliefs and positions dominate? How are sustainable development and entrepreneurship signalled?

2. Methods

Initially syllabi, curricula and programme presentations will be analyzed in order to provide an understanding of the content of the policy documents that form the basis for teaching on the technology programme. Here we can describe a school practice - the technology programme in upper secondary school. In the steering documents we find statements and positions both from the technology area in society and political values but also from technology education research. All relevant steering documents for the technology programme are compiled: Education Act, upper secondary Ordinance, curriculum, diploma goals and syllabi (Swedish National Agency for Education, 2010), but also information and

presentation materials about the programme from The Swedish National Agency for Education. The documents could be seen as a discourse within a school practice. In this way the analysis is inspired by both Bourdieu's (1996) theories of a social practice and by discourse analysis (for example by Gee, 1999). The result is a description of the technology programme seen as a social practice where concepts of entrepreneurship and sustainable development are found and constructed.

In this study we make a text analysis with a *discursive orientation* (Bergström & Boreus, 2010; Potter & Wetherell, 1987) but we start with a text analysis with a *content orientation* with aim to find and quantifying the concepts of sustainable development and entrepreneurship in the steering documents (Bergström & Boreus, 2010; Krippendorff, 2004). In the content oriented text analysis we search for following words: *sustainable development, sustainable, environmental, entrepreneurship and entrepreneurial*. In the discursive oriented text analysis we start with a presentation of relevant parts of the texts. Then we start to analysis the text with use of three discourse analytical questions as a tool: *What is the problem? What causes the problem? What solves the problem?* We analysis the text related to the research questions. As the last step in the analysis we search for specific patterns and structures and relate them to other research. This is a discursive oriented text analysis inspired from for example Foucault (Bergström & Boréus, 2010) but also inspired from the method in Mörkenstam, 1999 and Olsson, 1997. We relate this *discursive perspective* to a social practice including what individuals do, their behaviour, their habits and conventions more or less rule-governed. Bourdieu describes it as individuals' habitus (Bourdieu, 1996) that generates strategies that will be related to the *doxa* (high valued beliefs, norms etc.) in the social practice (Bourdieu, 1977). The patterns and structures that we search for in the texts could be seen as parts of a *doxa*.

The steering documents that are analyzed are: 1. The Education Act (SFS 2010:800), 2. The upper secondary Ordinance (SFS 2010:2039), 3. The curriculum (Lgy11), 4. The diploma goals (Lgy11b), 5. Syllabi Technology with comments (Lgy11c; Lgy11d).

3. Results

3.1. The content oriented analysis

In the content oriented text analysis we found the following result:

Table 1. Result of the content oriented text analysis. Number of times the code words are found.

Document	Code words: Sustainable development Sustainable Environmental	Code words: Entrepreneurship Entrepreneurial
The Education Act	Sustainable development: 0 Sustainable: 0 Environmental: 0	Entrepreneurship: 0 Entrepreneurial: 0
The Upper Secondary Ordinance	Sustainable development: 0 Sustainable: 0 Environmental: 0	Entrepreneurship: Expressed in a special course on four different programs (not the technology programme) Entrepreneurial: 0
The Curriculum	Sustainable development: 3 Sustainable: 0 Environmental: 2	Entrepreneurship: 1 Entrepreneurial: 0
The Diploma goals	Sustainable development: 1 Sustainable: 2 Environmental: 2 in one specialization	Entrepreneurship: 1 Entrepreneurial: 0
The Syllabi of Technology (3 courses) with comments	Sustainable development: 0 + 2 (in comments) Sustainable: 2 + 11 (Sustainable society) + 2 (in comments) Environmental: 0 + 1 (in the comments)	Entrepreneurship: 2 + 3 (in comments) Entrepreneurial: 0 + 0

The different code words are not used in the texts to a significant extent, not at all in the Education Act and in the Ordinance. In the Curriculum and in the Diploma goals sustainable development, sustainable and the word environmental are used in formulations to greater extent than entrepreneurship and entrepreneurial. But in The Syllabi Technology (the most concrete describing of three courses: Technology 1, 2 and 3) entrepreneurship seems to have a greater impact. Even if writings about sustainable development exists, they seem to get more diminished and less committing the closer you get to the actual teaching situation (in syllabi related to courses), more specific descibed as "sustainable society".

3.2. The discursive oriented analysis

3.2.1. The Education Act and the Ordinance

Even if the political level has formulated strategies for both sustainable development and for entrepreneurship in the field of education[2] the concepts haven't been explicitly expressed in the Education Act (neither in the Ordinance).

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[2] Government communication 2005/06:126 and
http://www.sweden.gov.se/content/1/c6/12/99/99/e6e61481.pdf

In the Education Act text we find other expressions and formulations that could be implicitly related to sustainable development such as; "respect for the human rights", "fundamental democratic values that the Swedish society is based on" and "all people are equal" and "solidarity between people" but also "an active participation in community life". There is a strong focus on the individual, human rights and the democracy in the Swedish society. But there are no formulations about the individuals' relation to nature or a global solidarity. Implicit formulations related to entrepreneurship emphasis a conducive to "students overall personal development to active, creative, competent and responsible individuals and citizens". There are no clarifications about what areas or in what direction the responsibility will develop.

Education will give a ground for "skills for work". The texts are not pronouncing responsible for especially sustainable development. Here is manifested the importance of citizens who are accomplished, creative individuals active in working life and society life without any direction given. The individual is elevated and the importance of developing into a well-functioning professional active corporate citizen emphasis, but no guidance on how and what individuals should think or do. Problems and causes of the problems are not expressed, but an interpretation of the underlying problems are possibly unemployment and unparticipation. The solutions are not clear for the teaching situation, but instead the text makes visible a product of education - an ideal citizen. We notice a focus on the individual and more of an individual approach. Here we can relate to education for sustainable development and students with "action competence" (Öhman, 2003), dealing with problems and identifying possible solutions (UNECE, 2005) but also an entrepreneurial approach (Sarasvathy, 2001). In the Education Act, without specific formulations about what a student actually will learn, we thus find a dominant belief that the student must have opportunity to develop into a creative, competent, responsible citizen and thereby with a specific active approach suitable for a reality where work and engagement in society are important.

3.2.2. The Curriculum

The Curriculum (Lgy11, 2011) takes a starting point in the formulations that are presented in the Education Act but it express more concrete and specific explicit content related to

sustainable development and entrepreneurship. For example some expressions related to sustainable development and environmental:

> "Everyone, working in the school, have to promote respect for every human being and respect for our common environment" (Lgy11, 2011 translated by the author).

> *"The environmental perspective* in education will give the students knowledge so they can contribute to prevent negative environmental impact and get a personal approach to the overall and global environmental issues. The education will show how functions in society and our way to live and work could be adapted to sustainable development" (Lgy11, translated by the author)

And we also find example on formulations related to entrepreneurship:

> "The school will stimulate students' creative thinking, their curiosity and self confidence and their motivation to consider and implement new ideas in action and to solving problems. The students have to develop their competence to take initiative and responsibility and also to work both by themselves and cooperate with others. The school will also give the students possibility to developing knowledge and an approach promoting entrepreneurship, business- and innovation thinking. Thereby the students increase their wherewithal to starting and running a company by themselves. Entrepreneurial skills are very high valued in vocational life, in the society life and for higher education". (Lgy11, translated by the author)

The Curriculum state problems with environmental aspects in only one expression: *the complexity of the environmental issues place new demands on people's knowledge and ways to act*. There is no more detailed explanation about what environmental issues could stand for. The solution of environmental problems is knowledge but also a developed personal approach to such issues and how our work and our way to live could be adapted to sustainability, without pointing out examples, solutions and directions. The text related to entrepreneurship involves both preparing for starting a company and a more entrepreneurial approach. For entrepreneurship we find more explanations and concrete formulations, compared to the environmental perspective, for the students' specific knowledge: problem solving, reflecting

over experiences and get the possibility to use experience from companies and other actors in society outside the school.

The Curriculum also highlights other problems such as discrimination, slanderous treatment and a negative view of cultural diversity with much more explanations and political statements. Lack of knowledge is seemed to be the pervading reason. Solutions are therefore presented as knowledge and discussions, the importance of giving students a confidence in identity but also an identity characterized by a global view and an international perspective. Here we can find a relation to sustainable development and a very distinct direction. So once more we notice a focus on the individual and the human rights. Democracy issues are very high valued and explicit and clearly stated, students have to develop with a will to take personal response over their own situation and an active place in society. In many formulations the importance with responsibility, values for working and acting in society are highlighted. The problem is not explicitly presented but we interpret problems with unemployment.

Another focus is how important it is that students learn to think critical and see consequences of different alternatives and also give the students the ability to take a personal position. Here we can relate skills to "action competence" and competence for problem solving, also emphases within an approach related to sustainable development but also to entrepreneurship. So, just like within the Education Act the focus is on the individuals' education to an active citizen working with responsibility and creativity, important for both sustainable development and entrepreneurship. But no specific environmental issues are formulated, no conflict with economic growth is mentioned, no issues related to ecological boundaries, energy issues or to consumption are signalled. Such themes and realities are absent in the Curriculum.

Both The Education Act and The Curriculum are overall steering documents giving directives from the political level down to the particular school and *all* its programs. And even if neither sustainable development nor entrepreneurship is printed out in The Education Act we notice how sustainable development and entrepreneurship are implicitly described in these documents.

Sustainable development is largely revealed and signalled as an approach characterised by "action competence", democratic competence, critical thinking and understanding for global solidarity, also found in earlier research. Here we find a focus on the individual and on human rights and not on environmental problems and dilemmas. The reality of sustainable development in these texts is very close to the themes and expressions that explain entrepreneurship. In these documents we notice that sustainable development and entrepreneurship can be seen as a "happy couple".

3.2.3. The Diploma Goals for the Technology Programme

In this text for Diploma Goals all formulations are related to particularly the Technology Programme and this overall steering document will be operating the teaching in the programme. Here we find how the text is focusing on technology in relation to sustainable development.

> "The education should develop students' knowledge of and skills in technology and technological development. It should also highlight the role of technology in the interaction between people and nature with regard to sustainable development" (Lgy11, English version of the Diploma Goals).

> "The education should show the relationship between the different components of technological development processes, and contribute to students understanding the whole chain in the development of technology in a sustainable society" (Lgy11, English version of the Diploma Goals).

The importance of technological development emerge in the text, a definition is presented as: "technological development involves analysing needs, developing an idea, designing, constructing, producing, using, selling and recycling" (Lgy11, English version). The *technological development* seems to be the ground for activities and goals, from that basis different perspective will be taken, for example a sustainable society as a result. We understand from the text that the technological development itself couldn't be seen as a problem within the programme seen as a social practice. The problem is more the consequences of and different approaches to the technological development. So in this programme the technological development appears to be something necessary. From that it is

important to view the consequences and minimize subsequent problems. The technology must for example be adapted to nature, people and to a sustainable development. We find how sustainable development is signalled as a frame for development but how the technological development in itself is the most important.

> "The education should build on ethical and responsible approaches to technology, and critical, creative and constructive thinking should be encouraged" (Lgy11, English version).

> "In the education, students should be given the opportunity to develop the ability to search for, select and process information with critical awareness of their source material. The education should also contain creative and problem-solving work forms, and give students opportunities to develop an interdisciplinary approach" (Lgy11).

The approach that emerges among the students gives the impression to be important. The students should evolve a critical, constructive and creative approach. In that we see an approach related both to sustainable development and entrepreneurship. An entrepreneurial approach is important and essential in technological development and therefore we find entrepreneurship more of a base and much more involved in the "spirit" of the programme, compared with a sustainable development perspective that signals more as a result or a frame.

> "Entrepreneurship and business are parts of processes where technologies are developed, and this should therefore be covered in the education. The education should encourage students to develop new and creative solutions in order to create and deal with change. It should clarify how the development of products and services, locally and globally, can take place in a sustainable way" (Lgy11, English version).

The *technological development* runs like a red thread through the text and an outcome appropriate for a sustainable society is important. As we understand the underlying problems are technical solutions unsuitable for ecological boundaries but the solution is an entrepreneurial approach which involves a creative, problem solving process.

The technology programme represents a school practice and in this steering document, the Diploma Goals, we notice a highly valued technology optimism there entrepreneurship has a dominant role but we also find how sustainable development gives important frames.

3.2.4. The Syllabi of Technology

In the introduction to the syllabi *the concept of technology* is defined as: satisfy peoples need och whishes through transforming resources of the nature or immaterial resources into products, processes, plants and systems (Lgy11, translated by the author). The aim with the subject technology is primary to understand "the chain" from idea to model, product or service to use and recycling but also to educate the students for entrepreneurship. Another aim is to understand how "the chain" can help the society to be more sustainable. Formulations also emerge that"the chain" will be explored with different perspectives, for example an historical and a human but also an ethical and a gender perspective. In the text *CDIO-influences* are stressed as technological development processes, entrepreneurship and communication and a clear example on"the chain" is the formulation how the programme goals are grounded in CDIO:

> The diploma goals take as their starting point the internationally used CDIO concept (conceive – design – implement – operate) to emphasise an engineering approach in the programme. CDIO is used by many international universities and university colleges in Sweden as well. The starting point is a desire to modernise education for engineers based on a number of principles of how education should be planned, carried out and assessed. Since the aim of the Technology Programme is to lead to eligibility for higher education in the technological sector, the approach taken by CDIO is covered in the education (The Syllabi comments, the English version).

The subject technology emerges in the Syllabi as even more focusing on "the chain" (The CDIO process) in which entrepreneurship has its implemented high valued place. Sustainable development is not forgotten, there are formulations like "in the subject, students should be given the opportunity to assess technological solutions with regard to a sustainable society" but it seems to be more of a necessary aspect in the results of"the chain". "The chain" itself is never questioned, entrepreneurship is a central way to accomplish achievement. Entrepreneurship is the solution and sustainable development is the necessary result. In this text we find how entrepreneurship is more involved in the structure and how sustainable development is presented as an inevitable demand. A "sustainable society" is not in any expression explained or evolved.

In the technology courses (three of them) the technology development process comes up in presentation of core content and in knowledge requirements. Entrepreneurship is also included as explicit core content in contrast to sustainable development (not even mentioned) which is involved in the core content "the role of technology with focus on the technology for the future and for a sustainable society". In the courses core content entrepreneurship seem to has a more directly and expressed role compared with sustainable development, a concept which is demarcated to *sustainable society* and expressed as an aspect important to reflect upon in relation to technology. Due to the knowledge requirements the students are expected to, in different grades, value and analyze technology solutions from a sustainable society view.

4. Discussion

In the political documents, The Education Act and The Curriculum that steer and signals especial values for teaching in the study program at upper secondary school in Sweden, we find sustainable development and entrepreneurship as a "happy couple". We find both of them signalled as approaches making that the student obtains creativity, critical thinking and problem solving skills for an active citizenship in the society. Unfortunately are neither sustainable development nor entrepreneurship explicitly expressed in these documents but we can find formulations that can be related to the concepts. We thus maintain that both sustainable development and entrepreneurship (some of their different perspectives) are highlighted in steering documents and we emphases that a political aim is to connect them.

It is then interesting to see how different they are emphasized in the Diploma Goals for the Technology programme and in the more concrete course syllabi. Sustainable development seems to be valued lower compared with entrepreneurship and the technological development process. "The ability to analyze and evaluate technical solutions with regard to a sustainable society" is explicit in the goals for the technology program, but the word sustainability is not explained and defined in any of the courses or core content knowledge. Formulations are obvious in the overall projections, but the absence of specific meanings, specific issues or topics in the core content gives the teachers unspecified signals, they can choose to teach about sustainable development or not.

One conclusion can be that Sweden on an international level emphasizes ambitions to be regarded as a nation taking responsibility for the environmentally future but has not been able to transform this in to action in the educational system. Interesting is to notice that entrepreneurship is valued high in the technology programme and the relation to sustainable development is difficult to realize. In the technology programme there appears to be different larger fields that struggle to get positions and make impression. For example both the technology industry and the politicians have a great impact on attitudes and applications. And the dilemma between economical growth and sustainable development, highlighted by some actors in society, is avoided in the technology programme, a programme where it seem to has a relevant arena.

The political intentions with a broader entrance to the technology programme, with the objective to recruit primarily female students, could be more effective if sustainable development and entrepreneurship are signalled as a "happy couple" on all levels of the steering documents. But then it probably would be required more implementation of concrete content of, and issues about, sustainable development into the technological development process presented in the syllabi. More of critical thinking, contestations and strategies connected to environmental issues have to be involved in the process and visible expressed in core content. Such as an entrepreneurial approach is necessary, an approach nearly connected to the bases of sustainable development, is necessary for a technological development. If that could be clarified it would be a way to invite other groups to the process and thus leave the more traditional view on students on the technology programme.

5. References

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