

Exploring changes of conceptions, values and beliefs concerning the environment

A longitudinal study of upper secondary school students in business and economics education

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Abstract

This thesis examines students' understanding of economic aspects of global environmental problems. The first aim is to identify and characterise changes in business and economics students' conceptions of negative environmental effects and pricing goods and services. The second aim is to identify and characterise changes in students' values, beliefs and personal norms regarding effective solutions to climate change problems. Three studies were carried out with students in Swedish upper secondary schools. The first study used an open-ended questionnaire and is presented in Article I. The second and third studies drew on a longitudinal study, using both qualitative and quantitative research methods and results are presented in Article II and Article III.

Article I shows that students' awareness of environmental issues varies in relation to the type of good. Some goods are seen as more harmful to nature than others, for example, jeans were not perceived as environmentally negative while beef burgers and travel services were to some extent. This indicates that environmental references are often characterised through perceptible aspects of goods' production i.e. being more expensive because of environmentally friendly production. Furthermore, some understanding of negative externalities was revealed. Interestingly, when value aspects of how prices *should* be set students more frequently refer to environmental impact.

Article II describes changes in students' price and environmental conceptions over the course of a year. It identifies the fragmentary nature of students' every-day thinking in relation to productivity, consumer preference and negative externalities. Differences in conceptions of how prices are linked to negative impact is characterised in terms of *basic*, *partial* and *complex* understandings of productivity as well as *basic* and *partial* understandings of consumers' influences. Partial conceptions are seen as students' conceptions in a process of change towards a more scientific understanding of price and negative environmental impact. Most interestingly, the results show that more than one aspect of environmental impact and pricing are simultaneously relevant. This is highlighted by a change from views putting productivity at the centre for how prices *are* set to include consumers' preferences when judgmentally describing how prices *should* be set. The results conclude that students show a broader content knowledge regarding pricing and the environment when including normative preferences.

Article III explores changes in students' *value orientations*, *beliefs* regarding efficient solutions to climate change and *norms* for pro-environmental actions. Small changes are observed regarding the three constructs. Value changes are reported in terms of a small average increase in importance of altruistic, biospheric and egoistic orientations while common individual changes are shown in shifts between weak and strong values. Beliefs regarding efficient climate change solutions are taxes and legislations while changes in market prices are perceived as being least effective. The findings show no direct relations between values and norms hence change in norms is associated with values through changes in beliefs.

Keywords: *environment, sustainability, interdisciplinary, longitudinal study, conceptual change, prices, externalities, values-beliefs-norms, climate change solutions, upper secondary school students, business and economics education.*

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- III. Ignell, C., Davies, P., & Lundholm, C. (Manuscript submitted for publication.) A longitudinal study of upper secondary school students' values and beliefs regarding policy responses to climate change.

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1. Introduction

This thesis addresses changes in upper secondary school students' understandings within the interdisciplinary area of economics and environment. The main focus is about students' views on the pricing of goods and services that causes negative environmental impact, during both production and consumption. Furthermore, the dissertation also explores changes in students' value orientations and changes in beliefs of how to solve climate challenges efficiently.

Global awareness of climate change and its worldwide negative consequences are recognised in international policy documents as well as in international agreements during the past decades (for example the Kyoto Protocol, 1998 and the Paris Agreement, 2015). These stipulate the importance of not passing two degrees (Celsius) of global temperature increase and stress the need for profound planning and resource-management. It is also well known that environmental education plays an important role in the preparation of societies' 'housekeeping' through teaching and learning (Gough, 2013; Stevenson, Wals, Dillon, & Brody, 2013; United Nations, 2015). Furthermore, the Intergovernmental Panel on Climate Change (IPCC) mentions, in its fifth assessment report, Greenhouse Gas (GHG) as an example of environmental degradation and a *negative externality*. This problem, more specifically, is that "a person whose activities emit GHG does not bear the full cost of their activities; some of the costs are borne by those who are harmed by the emissions." (Kolstad et al., 2014, p. 227). In economics theory, negative externalities are understood as consequences of a market failure, since the costs associated with such externalities are not, or not fully, reflected in the price of the product or service. Hence, negative externalities are external costs that affect someone outside the relation between the seller and buyer in a market.

The United Nations Environment Programme (UNEP) has estimated that "external costs relative to global GDP in 2008" were nearly 11% (UNEP, 2011, p. 18). The same report projected that the social costs from environmental degradation generated by humans would be almost 18% in 2050. When adopting the perspective of relations between markets' pricing and environmental degradation presented above, it becomes urgent to study students' understandings of pricing in relation to such negative externalities.

The thesis contributes to a limited set of educational research (Chang-Rundgren & Rundgren, 2010; Lundholm & Davies, 2013) that relates economics aspects to sustainability (Giddings, Hopwood, & O'Brien, 2002). This is addressed by focussing on business and economics programme students in an age group and educational setting that have received very little attention. In addition to the economic perspective, environmental degradation can also be seen from an ethical perspective (Sen, 1987). Research of students' conceptions should, therefore, take into account the relationships between values and beliefs about governmental and market-generated solutions to tackle climate change as well as conceptions of pricing and value orientations. Research has suggested that values are generally slow to change (Rokeach, 1973; Schwartz, 2005). However, changes in life path can initiate rapid shifts in individuals' value orientations (Sheldon, 2005). The thesis takes the latter view, and argues that it is important to explore upper secondary students' conceptions and values, since they are about to make key decisions on their education and future occupation (changing their life path) as they finish compulsory schooling. Also, they will start to use their democratic rights when voting in local, national and international elections, thereby showing value preferences for economic and environmental directions. Therefore, the last year in upper secondary school is seen as an important time in their lives. In addition, the choice of year is supported by Bogt, Meeus, Raaijmakers and Vollebergh (2001) and Hofmann-Towfigh (2007), who point out the need for empirical studies that examine young peoples' values in diverse school settings, as well as changes in them over one school year.

In an early work, Ausubel, Novak and Hanesian (1978) stated that it is important to map out learners' knowledge at the beginning of a learning sequence. Specifically, they highlighted that the most important single factor influencing learning is what the learner already knows, and that this should be known in order to guide the teaching. This continues to be a vital interest in contemporary teaching and learning literature that highlights the importance of learners' "already known" understandings (Hattie & Yates, 2014, p. 146).

1.1 Aim of the thesis

There are two overarching aims of the thesis. The first aim is to identify and characterise changes in economics students' conceptions of negative environmental effects and the pricing of goods and services. The second aim is to identify and characterise changes of values, beliefs and personal norms regarding effective solutions to climate change problems.

The following research questions are addressed:

- i. How do students conceptualise environmental degradation in relation to the prices of goods, and what changes and stabilities do they show regarding how prices reflect, and should reflect, environmental degradation? (Article I and Article II).
- ii. What changes and stabilities are there in students' value orientations, beliefs and personal norms regarding how climate change should be solved, and to what extent are there changes in relations between the constructs? (Article III).

1.2 Outline of the thesis

The thesis is based on three studies, which are presented in three articles where Study I is equal to Article I, and so on. The first study is built on an open-ended questionnaire and the second and third studies report results from a longitudinal study, using both qualitative and quantitative research methods. After this introductory section, the second and third chapters present the background against which the studies have been framed. This background consists of theoretical and empirical bases for studying changes in students' conceptions, values, beliefs and norms. In the fourth chapter, I describe the methods used and defend the methodological choices that were taken. In the fifth chapter, I present the empirical studies through a summary of each study and their results in relation to the thesis' overarching aims and research questions. Finally, I discuss the findings, implications for education and future research in Chapter Six. I present the interview guide and instruments used for data collection in the appendices.

2. Theoretical frameworks

The thesis' research questions are linked to two theoretical traditions: conceptual change research and environmental psychology research on individuals' values, beliefs and norms relations to environmental behaviour. The following chapter will provide definitions of constructs from these two research fields and describe how they inform the empirical studies of the thesis (see Figure 1).

Theoretical frameworks

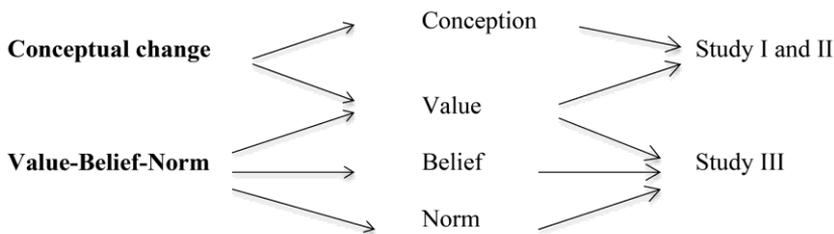


Figure 1. Overview of the studies theoretical frameworks

2.1 Conceptual change research

The two first studies (Articles I and II) were developed within the theoretical learning perspective of constructivism, in which conceptual change is seen as a process that comprises earlier experiences and insight in relation to the processing of new information (Fosnot & Perry, 2005). Piaget used the definitions of assimilation and accommodation of information to describe the processes of an individual's adaptation to a new (situational) context (Piaget, 1950/2010). Theories of conceptual change have taken various historical directions since the 1950s, and they will be described in the first part of the following theoretical background section and in relation to the aims of the thesis. I will specifically differentiate between research that focuses on the outcomes of learning and research on the actual learning processes (Vosniadou, 2013).

Conceptual change theory traditionally describes the individual's learning as a change from an initially naïve understanding to a more scientifically correct understanding of a phenomenon. Usually, conceptual change is understood as 'spontaneous conceptual change' caused by experiences of children's everyday situations or 'instruction-based conceptual changes', which are generated as a product of organised interventions (Hatano & Inagaki, 2006). Driver and Easley (1978) discussed the differences between naïve understandings and scientific knowledge. They emphasised the actual content of students' ideas and suggested that naïve understanding should be regarded as 'rational sense-making', rather than scientific misconceptions, within a framework that is an alternative to the framework used in conventional science. The *framework theory* pointed toward learning as involving a "...structured organization of a knowledge system in which concepts take their meaning from the theories in which they are embedded" (Driver, 1989, p. 481). An example of a framework is a child's ontological idea of the existence of 'up and down' in relation to the globe and planetary objects (Vosniadou, Vamvakoussi, & Skopleiti, 2008). The nature of this existing (naïve) knowledge has been shown to be robust and hard to change through teaching if education does not invite a radical conceptual change. This radical approach involves changes in fundamental assumptions about the world's construction and how knowledge is perceived, which, in the next turn, generate cognitive conflicts when it comes to the understanding of concepts such as force, heat and energy. The much-cited research by Posner and colleagues concluded that learning is a rational activity to the individual; although not denying that affective variables are important, "the claim that learning is a rational activity is meant to focus attention on what learning is, not what learning depends on" (Posner, Strike, Hewson, & Gertzog, 1982, p. 212). Identifying learning as a rational activity was seen as a *cold* conception, and all other constructs identified were grouped as *warm* constructs, and opposed to the (cold) rational one. The importance of individuals' 'warmth' factors (such as goals, motivation and intentions to change or not change) has been emphasised as being influential on conceptual change as much as cognitive structures (Duit & Treagust, 2003) and is described further in a later section.

Although the traditional 'replacement model' for conceptual change implies conceptual change as a linear replacement movement from A to B, this does not seem to tell the full story of learning. Research has shown that parallel conceptions can exist and even contradict each other, thus supporting the understanding of learning as a gradual shift towards scientific explanations of a concept, rather than replacement of one concept with another (Caravita & Halldén, 1994; Halldén, Scheja, & Haglund, 2008). There are few longitudinal studies that show this concerning students' understanding of social science

concepts; the existing research has focused primarily on concepts of science (e.g. Larsson & Halldén, 2010).

2.1.1 Warm conceptual change – a new perspective

Piaget (1950/2010, p. 6) proposed that “affective life and cognitive life” are inseparable, although traditional conceptual change research has focused more on describing *outcomes* of conceptual change than on describing *processes*. By including the affective constructs, ‘warm’ conceptual change contradicts a view of rational cognition. The warm perspective proposes that the process of conceptual change depends on the learner’s motives, goals and emotions (Pintrich, Marx, & Boyle, 1993). More specifically, these researchers state that “the actual content of students’ theories and models is influenced by personal, motivational, social, and historical factors, as shown by the existence and persistence of students’ misconceptions in science” (p. 170). The emphasis on these aspects gives a picture of the learning process as a complex interplay of the learner’s knowledge, intentions, and the cultural and social situations (Sinatra, 2005; Sinatra & Pintrich, 2003). It also addresses the question of how to identify motivational and warm constructs within a learning process, and in regard to their nature of being intentional rather than evolutionary (see Posner et al., 1982 for a description of conceptual understanding as conceptual ecology).

Research by Pintrich and Sinatra (2003) presented a handful of mediating warm constructs, for example: an individual’s ‘mastery goals’, ‘epistemological beliefs’, ‘personal interest’, ‘values’ and ‘control beliefs’ that all influence conceptual change. Many years after Piaget’s work on individual’s (children’s) learning, Sinatra and Pintrich (2003, p. 5) emphasised affective factors in terms of an *intentional approach* to conceptual change. They defined intentional conceptual change as “goal-directed and conscious initiation and regulation of cognitive metacognitive, and motivational process to bring about a change in knowledge”. They meant to include the learner’s role in the change process by acknowledging, for example, classroom context and the social and cultural context in which the learner is engaged. Reasoning along these lines suggests that the individual’s emotions and motivations can be triggered when values are at stake in conceptual change; and these have particular relevance to the study of conceptions of economics in relation to an environmental perspective. Therefore, this thesis accepts the warm conceptual change argument as an analytical concept that gives a more complete understanding of learning processes. Furthermore, Lundholm and Davies (2013, p. 295) describe economic phenomena as “*products* of human choices, beliefs and values”, and it is therefore rational for this thesis to draw on previous research on the existence and stability of different value orientations and beliefs.

The conceptual change research field recognises multiple theoretical frameworks that have been shown to add fruitful ways of approaching learning – particularly within the science field. Furthermore, Duit and Treagust (2003, p. 680) suggest that, “...multi-perspective frameworks have to be employed in order to adequately address the complexity of the teaching and learning process.” Students’ values are approached from two different perspectives in this thesis; in the first and second studies, individuals’ values are viewed as an overarching framework for conceptions of how pricing should be set for goods. In the third study, the second perspective views individuals’ value orientations as framing their environmental beliefs and personal norms for environmental behaviour, and this will be described in the following section.

2.2 Environmental values, beliefs and norms

Values are here defined as more basic, relatively stable worldviews and more existential compared to related objects such as attitudes, beliefs and opinions. Values are also seen as abstract constructs that embrace the individual’s desires and go beyond specific situations rather than focusing on a particular object or activity. Values are guiding principles and, given this function, vary in importance and are ordered in systems of priority (Rokeach, 1973; Schwartz, 1994). Examples of values are: equality, freedom, justice, happiness, solidarity and truth. This means that, when competing values are activated in a specific context, the ‘winning’ value is grounded in the value that is considered most important (Van den Berg, Steg, & De Groot, 2012). Furthermore, “Values are normative views about the world. Values are concerned with the way the world ought to be not just with the way the world is.” (Yencken, Fien, & Sykes, 2000, p. 40).

To date, research on environmental values (e.g. De Groot & Steg, 2007, 2008; Stern 2000) has been largely framed by the work of Schwartz and colleagues (Schwartz, 1994; Schwartz & Bilsky, 1987, 1990). Schwartz, Melech, Lehmann, Burgess, Harris and Owens (2001) defined a common classification of 56 values that are supposed to be structured in a universal way, even though their importance may differ between individuals and cultures. These values were categorised as self-transcendent values, embracing *altruistic value orientation* and self-enhancement expressing *egoistic value orientation*. To further clarify altruistic values, Stern (2000) added environment-related items and thereby *biospheric value orientation*. This framework suggests that each of these value orientations will regulate particular beliefs about which individual and social actions are more likely to be ‘good for the environment’. Egoistic values encourage individuals to care for the environments from which they derive personal benefit, and to oppose ‘pro-environmental’ actions they

perceive as damaging their personal interest. Altruistic values encourage support for 'pro-environmental actions' that an individual believes will have a net benefit to humanity, regardless of personal net benefit. Biospheric values treat physical environments as having intrinsic worth, regardless of any calculation of net benefit to humanity. Individuals may embrace several parallel value orientations and, to various degrees, they may change between individuals and socio-cultural contexts (Dietz, Fitzgerald, & Shwom, 2005; Stern & Dietz, 1994).

Recent value research has explored these values from a range of approaches, such as cross-cultural (De Groot & Steg, 2007), longitudinal (from a lifespan perspective) (Milfont, Milojev, & Sibley, 2016) and in learning processes with subjects embracing contested concepts such as nationalism and gender (Murstedt, Jansson, Wendt, & Åse, 2014; Murstedt, R. Trostek, & Scheja, 2015). In spite of this, the traditional approach in the teaching and learning literature recognises values as objects that might hinder or support a learning process. Environmental education research has also examined individuals' environmental values, for example, in relation to behaviour. This is based on an interest in connecting learning and educational goals to promote pro-environmental change. For example, through a study of 2800 college students, Whitley, Takahashi, Zwickle, Besley and Lertpratchya (2016) found support for environmental political candidates, recycling, reduced electricity use, food selection and transportation choices was varied due to value orientations, where students with biospheric and altruistic values participated/engaged more in a range of described behaviours compared to students with egoistic values. Regarding the nature of individual values, there seems to be theoretical agreement that they are slow to change (Rokeach, 1973) and that values host other attitudinal aspects such as beliefs, emotions and various behaviours, although this final relation does not always show a causal relationship to environmental behaviour (Kollmuss & Agyeman, 2002; Portinga, Steg, & Vlek, 2004). However, changes in life path can influence or generate a rapid shift in values, that is, the more significant the life-changing event, the greater the value change (Bardi, Lee, Hofmann-Towfigh, & Soutar, 2009). Therefore, in this thesis, it is seen as important to explore students' values in their last year in upper secondary school, since students are about to decide on key educational and occupational matters when finishing compulsory schooling.

As mentioned above, environmental values and beliefs have been studied through a theoretical framework developed by Stern (2000), which suggests that attitudinal factors consisting of values, beliefs and norms have a causal relationship to environmental behaviour. This view has been supported by empirical studies that investigate the impact of pro-environmental values on behaviour specifics such as energy policies (Steg, Dreijerink, & Abrahamse, 2005). The framework has also been used in a variety of samples and studies

(for an overview, see Dietz et al., 2005). Furthermore, Stern (2000) stresses the importance of investigating “the nature and determinants of people’s beliefs about the environmental significance of behaviors.” (p. 408). Along the same lines, one aim of this thesis is to explore students’ beliefs concerning solutions to climate change through market and political measurements, along with their beliefs about pricing of goods that generate negative environmental impact. ‘Belief’ is here defined as a specific idea about some aspect of life, a prescriptive and evaluative entity that is a statement about the appropriateness of a position or activity in a given situation. It reflects a general assessment of an attitude-object and “specific beliefs within a belief system tend to form a more or less integrated whole although the belief system may display many internal inconsistencies” (Yencken et al., 2000, p. 40).

The theoretical proposition for what Stern called the ‘values-beliefs-norms’ theory (VBN) is that beliefs are mediating elements between value orientations and the stance that individuals adopt towards environmental problems. Stern’s (2000) model distinguishes between three types of belief (see Figure 2). The category of ‘adverse consequences (AC) for valued objects’ refers to beliefs about the impact of an environmental problem or attitude to an object (such as climate change) according to whatever is valued by the individual. This construct is sometimes referred to in the literature as an attitude (e.g. Schwartz, 2012, p. 16). This thesis’ primary concern is with the category defined by Stern as “perceived ability to reduce threat”, which includes beliefs about the relevance of personal actions as a consumer, an activist and a supporter of national policies. In the words of Schwartz, these beliefs “are ideas about how true it is that things are related in particular ways” (Schwartz, 2012, p. 16). Whilst the model is quite explicit about the formation of AC in the context of value orientations, it is less definite about whether ‘ability to reduce threats’ (AR) beliefs also are formed in the context of value orientations. Specifically, one could ask, are AR beliefs about relationships between things formed independently of value orientations, or does a particular value orientation predispose an individual to a high subjective probability that event X will lead to consequence Y?

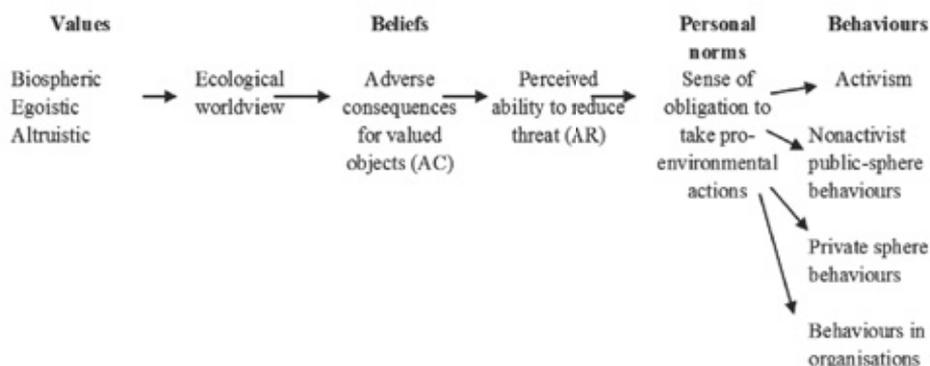


Figure 2. A schematic representation of the VBN model (adapted from Stern, 2000, p. 412)

Further, this thesis concentrates on actions of consumers and on government policies concerning taxes, subsidies, regulation and information. These can be regarded as behaviours such as ‘private-sphere behaviours’ and ‘non-activist public-sphere behaviours’ in the last columns in Figure 2. The thesis therefore builds on earlier studies using the construct of environmental beliefs and stemming from the value-belief-norm theory of environmentalism that considers normative factors to promote environmental behaviour (De Groot & Steg, 2008; Stern, 2000).

Pro-environmental beliefs; such as those used in the New Environmental Paradigm perspective (NEP) by Dunlap and Van Liere (1978), consequences of environmental awareness, the ability to reduce environmental threats, and personal norms, are theoretical and empirically shown indicators of specific pro-environmental behaviours of non-activist support for environmentalism. This thesis’ viewpoint is that the value-belief-norm theory provides a sound basis on which to study school students’ environmental values and beliefs regarding solutions to climate change (Stern, Dietz, Abel, Guagnano, & Kalof, 1999).

According to the VBN framework (presented in Figure 2), individuals engage in pro-environmental behaviour because they feel the moral obligation to behave properly (norm) when they feel responsible (ascription of responsibility, AR) for the consequences of their actions that harm the environment (awareness of consequences, AC). AC is supported by general pro-environmental beliefs (e.g. the New Ecological Paradigm, a revised New Environmental Paradigm Scale). This measures environmental worldview through 15 statements such as “Humans are seriously abusing the environment” and “Humans were meant to rule over the rest of nature” (Dunlap, Van Liere, Mertig, & Jones, 2000), which in turn are influenced by specific values (i.e. biospheric, altruistic or egoistic). Stern (2008, p. 366) summarised this process by claiming that

engaging in a certain behaviour occurs “when an individual comes to believe that a personal value is threatened and that he or she can relieve that threat by appropriate action”. The NEP scale can be criticised for not measuring specific environmental topics; it rather focuses on general beliefs about human-environmental relations, and therefore this present study uses a metric designed to explore beliefs about the efficiency of various methods for solving climate change (Best & Mayerl, 2013).

Furthermore, this prompts the question of what the relation between an attitude and a belief may be. A useful way of describing these different constructs is that an attitude is a general evaluative reaction *towards* an object, a person, an issue, behaviour or other entity. An attitude towards a particular behaviour is caused by beliefs about the outcomes of performing the behaviour, where each of those outcomes is being evaluated (Staats, 2003). Suppose you consider engaging in voluntary work. Coming to a decision whether to volunteer would evoke various beliefs about what it would be like and would prompt an evaluation of each outcome in an overall positive or negative sense.

Concluding this section, it is shown that, rather than investigating general attitudes to environmental issues, research has tried to find underlying values that form a basis for more differentiated environmental attitudes (Schultz & Zelenzy, 1999). Following this interest in the fields of social psychology and environmental psychology, values are also in focus in environmental education and learning research. This identifies, or tries to understand the relationships between values, attitudes and behaviour, in order to be able to make strong conclusions about value changes and changes in people’s behaviour (Dietz et al., 2005; Leiserowitz, Kates, & Parris, 2006). Accordingly, this thesis explores changes in individuals’ value orientations and the valuing of environmental degradations, as well as personal norms for action from the perspective of upper secondary school students in business and economics education.

Previous educational research has not focused on business and economics students in the age group 17-18. However, students at this age are already experienced and independent consumers, and are approaching the age at which they can take part in democratic elections and thus influence the political agenda. The way in which they exercise their roles as citizens is a matter of collective concern, since their decisions will shape the way in which markets and politicians act (Lundholm & Davies, 2013). Therefore, this thesis aims to contribute to research on students’ beliefs, specifically concerning if and how individual, market and government can make a difference to climate change (Chawla & Cushing, 2007; Levy & Zint, 2013; Lundholm & Plummer, 2010). This is also in line with what Stern and colleagues (1999) suggested several

years ago: that future research should be explicit about which types of environmentalist behaviour are being investigated and which social-psychological antecedents are used as explanatory constructs, since constructs often seem to be vaguely grouped as attitudes.

As mentioned earlier, the theoretical frameworks for this thesis are from the research fields of conceptual change and environmental psychology. This chapter has provided definitions of central constructs that are essential to the thesis, which aims to identify and characterise changes in students' environmental conceptions and VBN. The reason for comprising these theoretical strands is that they provide a useful way of extending and enriching research on students' conceptions of price and externalities, as well as their beliefs and norms in relation to how they can act to solve climate change as consumers and citizens. Beliefs are thus directed by two frameworks: ways of understanding the world with reference to conceptual change theory, and the value orientations highlighted in the VBN theory.

Finally, the theoretical assumptions that are of importance here derive from what Stern (2000) called central factors and causal variables that influence individuals' environmental behaviour. These can be summarised as: i) attitudinal factors (including values, beliefs and norms), ii) contextual factors (interpersonal relations, social, political and economic contexts), iii) personal capabilities (demographic factors and the individual's knowledge), and iv) the individual's habits and routines. The empirical studies take into consideration aspects of the first, second and third variables, in that the individual's attitudinal factors, as well as understandings of price and externalities, are studied within the context of business and economics education.

3. Previous empirical research

As mentioned above, ‘conceptual research’ has mainly been focused on students’ learning in mathematics and science domains (Duit, 2007). This body of research suggests that learners’ intuitive understanding of phenomena is formed through everyday experiences. The resulting ‘everyday’ reasoning typically contrasts with, and hinders acceptance of, a more scientifically correct understanding (Brown & Hammer, 2008). However, students’ experience of climate change is less direct and the interpretation of these experiences, such as they are, has been a matter of some debate. Several studies have investigated students’ understanding of climate change and global warming and observed climate change to be related to various causes, e.g. the ozone hole or “the earth getting closer to the sun” (Shepardson, Niyogi, Choi, & Charusombat, 2009; Shepardson, Niyogi, Roychoudhury, & Hirsch, 2012; Österlind, 2005). It has also been shown that students conceptualise climate change as broadly influenced by human activities (Shepardson et al., 2012), and this emphasises a need for more research on environmental and socioeconomic issues (Reid & Scott, 2013). The focus of this thesis places it within the set of studies that have examined relationships between humans and their environment (Loughland, Reid, & Petocz, 2002; Shepardson, Wee, Priddy, & Harbor, 2007). This shows that students’ conceptions in this field can be broadly categorised as ‘environment as object’ to be used by humans and serve their interests, or the environment as having an intrinsic value that should be respected. These ideas involve a value dimension that can be connected to how the world and societies are constituted, as well as how these should be arranged. This underlines the normative influences in socio-environmental education and learning, and concerns how beliefs and values are related to conceptual change.

The following section provides an overview of findings regarding students’ economic understandings and, in particular, in relation to pricing. In addition to reflecting on what is already known, yet unexplored areas will also be addressed. There will also be a discussion about how this thesis adds to the understanding of pricing.

3.1 Changes in students' conceptions of pricing goods and services

A profound research area regarding children's understanding of the economy has been developed since the beginning of the 1950s – mainly within the cognitive interpretative tradition. The findings have identified universal development stages that young children go through in the process of understanding economic concepts. The findings also contained detailed content of various concepts such as money, the bank and price (Berti & Bombi, 1988). The studies that have explored price and value suggest that the price of goods can be defined by 'its characteristics, especially its physical characteristics'. For example, Burris (1983) showed by asking children aged four and five about commodities' values, that a diamond was perceived to not cost much because of its relatively small size. A book was seen as more expensive than a watch, which was again explained by their difference in size. Then, children aged seven and eight valued an object according to its usefulness to humans, and suggested that a watch would cost more than a book because one can tell the time from the watch, but with books "you can just read" (p. 799). Burris (1983) explored a third category of conceptions, among children aged 11, that addressed goods' production rather than consumption. An example of this was that a higher amount of material and work input to a good's production was perceived as generating higher cost. Similar findings conclude that the process of development (learning) goes from the first price understandings built upon the size of a good, work input and to consumer preference (namely, from concrete to value-oriented) (Berti & Bombi, 1988; Fox & Kehret-Ward, 1985).

It is further shown by Fox and Kehret-Ward (1985) that adults link supply and demand and take the buyers into account in the explanations of how prices are determined. However they rarely consider changes and systematic interaction of both demand and supply affecting price. This would build on a changed structure for understanding the price phenomenon that is characterised by seeing prices set within a 'structure perspective' rather than seeing prices established by a producer or seller within an 'agency perspective' (Lundholm & Davies, 2013). Concerning the study of demand, a study by Siegler and Thompson (1998) investigated children's understanding of sales by presenting two stories of supply and demand; children were asked to predict what would happen to the volume of lemonade for sale when there was a decrease in both the number of buyers and sellers of lemonade. The findings indicated that children understood demand by the age of four or five, and children aged

seven or eight understood the effects of supply (although not in relation to price).

In addition to the above-mentioned research, there are phenomenographic studies that have investigated upper secondary school students' and university students' conceptions of price. In a well-known study from 1978, Dahlgren and Marton asked economics students why a bun from the student canteen cost 50 öre (half of one Swedish krona). The findings distinguished between two main and two sub-categories of subjective meaning regarding how price was set, which in turn highlighted relationships between supply and demand, market price, and a description of how price is set by the characteristics of the item. In a more recent study, Pang and Marton (2005) conducted a 'variation study' in Hong Kong with five experienced teachers teaching two different groups of 169 16-18 year-old economics students. All students answered two written questions about how prices were set in two different contexts. The first question concerned the price decrease for live chickens as a consequence of bird flu, which had heavily reduced the number of chickens for sale. The other question concerned the price stability of illegal film copies despite a reduced supply because of legislation. After this pre-test procedure, ten of the students attended an interview and explained their written responses. The authors' findings provide a clear description of the qualitative differences in secondary economics students' understanding of price difference. Pang and Marton (2005) found five conceptions regarding price changes, where the second and fourth categories represented most students: i) change in features of the good; ii) change in demand; iii) change in supply; iv) change dependent on the interaction of supply and demand (without comparing the magnitude of change), which is exemplified by the change in people's willingness to buy the item and in the change of the number of sellers; and v) change as a function of simultaneous interactions between demand and supply (taking account of the relative magnitude of the change).

Ideas about how prices are constituted are often built on everyday experiences, and economics education does not always change students' basic or intuitive conceptions about price. The findings presented above show that conceptions of price may be categorised as reflecting: the intrinsic value of a product, demand for the product, supply of a product, or demand for *and* supply of a product. It further shows that very young children grasp demand-related phenomena before an understanding of supply. The most important aspect here is that environmental relations within socio-economics have received limited attention within the research literature on students' understandings, and few studies have examined the actual conceptual formation concerning this (Lundholm & Davies, 2013). Thereby, a problem regarding this research field is that the understanding of economic concepts has not been considered much in a wider social context (Webley, 2005). This thesis adds the environmental

aspect by applying negative environmental impact as a social context for price understanding. Furthermore, most research on conceptions of price has only looked at one point in time, or in the format of ‘before and after intervention’ studies (e.g. Pang & Marton, 2005) and there are no studies that explore price conceptions over the time span of a whole year.

Although research related to economic education has increased during recent decades, with a peak in published papers between 2005 and 2009 (Varum, Ferreira, & Breda, 2013), research combining sustainability and business/economics educations is limited; it mainly addresses management and business school curricula, or demonstrates various methods that faculties have used to integrate sustainability principles in their teaching, rather than understanding how students engage in sustainability matters (Cullen, 2015). The specific age group of 16-19-year-old economics students has received limited attention regarding economic understanding. An exception to this is a Swiss/Italian study by Berti and colleagues (2017), which explored non-economics students’ and economic students’ (both upper secondary and university students) ideas about the causes and consequences of the financial crisis of 2007/2008; it found few differences between those who did, and did not, study economics.

However, a comparable study by Sternäng and Lundholm (2012) was carried out on pupils in Chinese Green Schools, where researchers investigated students’ ideas about climate change and the associated environmental costs. Results showed that the students believed that environmental problems are unavoidable when developing an economy. Students believed that natural resources could be controlled and taken care of using the benefits of economic growth (GDP). The same study also suggested that students do not see a conflict between economic growth and environmental care. Furthermore, Davies and Lundholm (2012) studied young English peoples’ conceptions of how pricing should be arranged for different goods and services; the authors asked what should be provided for free to consumers and presented to respondents a variety of goods associated with both positive and negative consumption and production externalities. The study reports on some conceptions, which incorporate consumption externalities. Some students argued that individuals should have to bear any personal health costs that arise from over-consumption of food, which becomes an externality when they are borne by others, for example, through a national health system. The students expressed a belief that there will be ‘over-consumption’ when prices do not reflect costs in full. However, students only used this kind of reasoning in a minority of cases. An important thing to note from this is that research concerning young students’ conceptions of negative environmental impact in relation to pricing and negative externalities has not received much attention.

3.2 Changes in environmental values, beliefs and norms

The scope for education concerning the environment depends on the extent to which environmental values are open to change. Research suggests that adolescence is a critical period in terms of value formations and that there is a need for empirical studies that examine students' values in diverse school settings, as well as changes in them over the course of a school year (Bogt et al., 2001; Hofmann-Towfigh, 2007). Several environmental education studies have conducted pre- and post-design research with instructional interventions to show changes in environmental values, beliefs and conceptions (for an extensive overview, see Heimlich, Mony, & Yocco, 2013). As mentioned, individual's value changes are suggested to be slow processes and values reach stability in adults (Rokeach, 1973; Schwarz, 1994). However, value change can occur within a limited timespan too. For example, Verkasalo, Goodwin and Bezmenova (2006) showed, in a Finnish cross-sectional study composed of four matched sample groups of children and students, that security values increased dramatically after the terrorist attacks in the USA in September 2001. Also, changes in life path can influence a rapid shift in individuals' values (Bardi et al., 2009).

As mentioned earlier, one central point in this thesis is that researchers have argued that environmental problems are rooted in human values (De Groot & Steg, 2007, 2008). Within the field of psychology, research have focused on values and attitudes in relation to norms, and it was found that stronger personal norms related to stronger intention for pro-environmental behaviour such as reduced car use (Steg and Vlek, 2009). Furthermore, pro-environmental behaviour has been found to be influenced by demographic and educational factors, together with contextual factors, lifestyles, values, norms and attitudes (De Groot & Steg, 2008; Ojala, 2007). It has been argued by researchers and policy makers that values have important impacts on individuals' environmental concerns through their influences on thinking, decision-making and behaviour (De Groot & Steg, 2010; Dietz et al., 2005; IPCC, 2007; Karp, 1996; Leiserowitz et al., 2006). In this thesis, the focus is on exploring how values – defined as egoistic, altruistic and biospheric value orientations – can relate to pro-environmental actions and how these might change over the course of a year. In line with the importance of education's contribution to value formation, educational context is recognised as an important research area to investigate individuals' value changes and the relationship between values and behaviour.

To date, changes in business and economics students' (upper secondary) environmental values, and changes in beliefs regarding solutions' to climate problems, have not been researched. The findings of the studies mentioned in

the above review provide starting points for characterising individuals' values at one point in time. This raises the questions of how to operationalise students' value changes and what is considered as 'long-term' and 'short-term' change. Schwartz (2005) reports on value-stability over six weeks among a sample of German students (*N*157), however, measures of individual changes in value hierarchies are rarely seen. Another study, by Vecchione et al. (2016) explores stability and change in the personal values of young adults aged 20-28 through a longitudinal design. Measuring three times, they found value hierarchies to be stable, although the level of stability tended to differ according to age. Values of universalism, conformity, tradition and security changed significantly and were more stable in the older sample (24 to 28) compared to those aged 20-24. However, the report was built on an instrument for measuring self-transcendent and self-enhancement values (Schwartz, 1994) and it did not specifically include environmentally connected values or students aged 17-18, as in this thesis.

4. Methodology

This thesis aims to identify and characterise changes in young economics students' conceptions of negative environmental effects and the pricing of goods and services, as well as to identify and characterize changes in their values, beliefs and norms concerning how to solve climate problems. This chapter will describe the methodological considerations and rationales for the choice of the design. The first section presents an overview of the participants and this is followed by descriptions of the methods used in the three separate studies. The chapter ends with methodological reflections and ethical considerations.

4.1 Participants and the business economics curricula

Data were collected over 2.5 years with 322 students in eleven different Swedish upper secondary schools. All schools were contacted by written invitation before data collection. All students either took the A-level in business as an optional course, or followed the full programme of business and economics education for all three years in upper secondary school.

The first study (Article 1) was based on convenience sampling (Teddlie & Yu, 2007) and 110 students aged 16-18 participated (38 females and 71 males – one missing information) from six groups. The procedure for selecting participants in the longitudinal study (Articles II and III) was also based on convenience sampling and the invited schools should: a) be organised by the local government, b) offer business and economics education, c) be situated in urban or non-urban areas, and d) be located at a maximum of a few hours travel from Stockholm for convenience. In total, the author contacted 24 schools. Each school's principal or teacher in charge of business-economics or social science received a written invitation with a description of the aims of the research project, background and schedule. Nine schools responded positively to the invitation and the sample size was judged to meet the requirements of statistical analyses, generating potentially 253 participants.

From this sample, students from three schools were invited for interviews. The schools were chosen on the basis of representing localities/towns with approximately 20,000-40,000 inhabitants and 16 students volunteered to be interviewed. After the repeated measurement, participants received a cinema ticket as an acknowledgement of their contribution. The following tables 1a and 1b present an overview of the first study's metrics, number of participants and schools as well as the longitudinal study's mixed metrics.

Table 1a. Overview of participants and metrics

	<i>Instrument/Method</i>	<i>Partici- pants (N)</i>	<i>Age</i>	<i>Schools (N)</i>
Study 1				
Autumn 2010	Open ended questionnaire	110	16-18	2
Longitudinal study				
Study 2				
Spring 2012 (T1)	First interview	16	18	3
Spring 2013 (T2)	Repeated interview	15	19	
Study 3				
Autumn 2011 (T1)	First questionnaire	213 (212*)	17	9
Autumn 2012 (T2)	Repeated questionnaire	183 (142**)	18	7

* One respondent returned a blank survey at T1 and is excluded from analysis of the first year.

** Number of students identified at both T1 and T2.

Table 1b. Participants in the longitudinal study at time 1 (T1) and time 2 (T2)

	T1	T1	T1	T2	T2	T2
Class	Class members (N)	Participants questionnaire (N)	Participants interview (N)	Class members (N)	Participants questionnaire (N)	Participants interview (N)
1	31	22		31	27	
2	20	18		21	19	
3a	32	28		31	29	
3b	32	29		32	23	
4	24	22 (21)*	2	24	22	2
5	30	23	6	28	23	6
6	21	21	8	22	13	7
7	28	25		29	27	
8	27	18		-	-	
9	8	7		-	-	
Total (N)	253	213 (212)	16	218	183	15

Concerning the participants' curriculum background, they were following courses in line with the National Curriculum (for the Social Science program introduced in 2000 and studying compulsory courses in athletics, civics, English, aesthetics, mathematics, religion, science and Swedish. A full-time student following the three-year programme of business and economics received 2300 credits, where 350 credits were derived from exclusively business and economics courses. The programme's design was based on a system where one week of full-time work generated 25 credits and estimated the students'

effort and this was not related to time of instruction/teaching. This suggested that 14 full-time weeks over three years would be spent on business studies and economics studies.

The 1994 national curriculum for the Swedish non-compulsory school system (National Agency of Education, 1994) directed the syllabus that the students followed. The curriculum specifies several aims regarding knowledge, norms and values, where one section specified,

“An environmental perspective in education provides students with insights so that they can not only contribute to preventing harmful environmental effects, but also develop a personal position to major global environmental issues. Education should illuminate how the functions of society and our ways of living and working can best be adapted to create the conditions for sustainable development” (p. 8-9).

Furthermore, the curriculum’s description of the environmental aspects of business education proposed that “The school in its teaching of business economics should aim to ensure that pupils: reflect over ethical and environmental issues as a part of economic decision-making” (p. 8).

In 2011, the national curriculum was replaced with the current curriculum and subject syllabuses.¹ The new business management and economics programme is one of six national upper secondary education programmes. To obtain a diploma, students should have the knowledge needed for higher education studies, primarily in economics, law and other social science domains. The diploma goals specify that it should “provide knowledge about the conditions for sustainable development, not only from environmental but also economic and social viewpoints.” (National Agency of Education, 2012, p. 197). Although an environmental aspect of business economics is included in the two latest curricula, one might reasonably conclude that it is slightly more prevalent for the economic syllabus in the current curriculum. However, it is not specifically prioritised in relation to other subject content.

An overview of the characteristics of the longitudinal sample is presented in Table 2. This shows a very small difference between the first (T1) questionnaire participants and the ‘repeated’ participants (T1+T2). Furthermore, it shows that most students’ first choice of education at upper secondary school was the business economics programme. Interestingly, slightly more than half of the respondents acknowledged an interest in economics as the reason for their choice. The students themselves seemed to be involved in a wide range

¹ For an overview of differences between the former and the current system, see the chapter *A brief look backwards* (2012) (pp. 9-13) in *Upper Secondary School 2011*, by National Agency of Education, Sweden 2012.

of economic activities; about $\frac{3}{4}$ of the participants were recipients of the national student grant, more than half of the respondents earned money through work during weekends or holidays, and also more than half of the participants in T1 bought their own clothes.

Table 2. Students' characteristics

'Yes' responses to the following statements:	Participants T1	Participants T1 and T2
Total (N)	212	142
% male/female	44% male, 53% female	45% male, 55% female
a. One or both my parents studied at university.	65%	62%
b. One or both my parents run a business.	40%	37%
c. The business economic program was my first choice of education.	83%	85%
d. I study these subjects because I am interested in economics.	56%	57%
e. I want to prepare for university studies.	17%	20%
f. I take care of the study allowance.	76%	70%
g. I have an extra job.	56%	54%
h. I buy most of my clothes.	57%	57%
i. I have finished Business A level.	90%	88%
j. I have finished Civics A level.	85%	83%
k. I am a member of an environmental organisation.	0.9%	-
l. I am a member of a political organisation.	0.9%	-

4.2 Research design

4.2.1 First study

The first study was designed to understand whether students connected economic and environmental issues to various goods and services and, if so how they addressed these. The interest was also to explore students' views on what prices *should* be for various goods/services. A sample of 110 students in two different schools participated in an open-ended questionnaire with short 'story-like' descriptions of situations where the students took part in the purchasing of different goods and services.

4.2.2 Longitudinal study using mixed methods

The studies presented in Articles II and III use a longitudinal format. This means that the same phenomenon is studied over a long period of time and measured on at least at two occasions (Saldaña, 2003). This entailed gathering data from the same students at different points in time, and the research design reflects the research questions that focus on change in students' conceptions, values and beliefs over time. Two forms of measurement were used: one questionnaire and one interview. Each was carried out at two points in time and, altogether, the measures covered four semesters (see tables 1a and 1b). The measurements are further presented in the 'Data resources and the instruments' section 4.3.

In the Swedish school system, schools decide when to include national subjects such as business studies in the curriculum. To ensure that business and economics were scheduled, the thesis' longitudinal study was planned to start in the second year of the education. Another reason for this scheduling was that the course of international economics, which highlight the links between economics and environmental degradation, was conducted during the final year of education. The decision to conduct the survey prior to the interviews was taken to create a familiarity with the teachers and students before carrying out the individual interviews.

This mixed-method design has been described by Johnson, Onwuegbuzie and Turner (2007, p. 123) as research,

“... in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g. use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration”.

They further emphasise that “A mixed methods study would involve mixing within a single study; a mixed method program would involve mixing within a program of research and the mixing might occur across a closely related set of studies”. This thesis also ‘mixes’ within a programme in that it includes several studies that are closely related, in addition to the mix of both qualitative and quantitative approaches in the data collection. The reasons for conducting a mixed method approach for this thesis are: a) it can bring together a more comprehensive understanding of changes in upper secondary school students' environmental beliefs and value orientations, and b) both qualitative and quantitative foundations frame the research questions. The ‘mixing’ is thus present in the thesis in connecting findings from the two positions after separate analyses in the articles (Creswell & Plano Clark, 2011). The combi-

nation of different ‘data components’ follows a type of design that uses qualitative core components (Articles I and II) with a complementary sequential quantitative component (Article III).

The use of a mixed methods approach is also supported by Brown and Hammer (2008). They mentioned that conceptual change research may be conducted through a range of methods and the research field offers various ways to conduct studies such as “... posing problems within that domain (of interest) in clinical interviews, observing students’ work in classroom interactions, and designing instruments to assess conceptual understanding” (2008, p. 141). Brown and Hammer suggest that research benefits from a variety of methods, such as “... starting with observations to find likely candidates of misunderstanding, designing clinical interviews to explore those candidates, and gathering qualitative data of the range of possible lines of reasoning...”.

An important thing to bear in mind when describing the process of learning is that time needs to be considered, and the choice of a longitudinal design makes it possible to investigate processes of slow change, which a short time design would not allow for. A second and more specific argument for conducting a longitudinal study relates to research on conceptual change that describes understanding and learning as a gradual shift towards scientific explanations of a concept, rather than replacement of one conception with another (Caravita & Halldén, 1994; Halldén et al., 2008; Larsson & Halldén, 2010). In general, there are few longitudinal studies concerning students’ understandings of social science and interdisciplinary concepts; as mentioned, the existing research is mostly focused on concepts of science (see for example Clark, 2006; Hell-dén, 2005).

4.3 Data resources and the instruments

There were three instruments used in the data-gathering procedures. An open-ended questionnaire was developed and used to collect data in the first study (Article I). The repeated interview guide used in the second study (Article II) was formed partly on the basis of the same questions in the first study, and the same examples of goods/services for reasoning were focused. A Likert scale questionnaire was used to measure changes in and relations between values, beliefs and norms with regard to solutions to climate challenges in study three (Article III).

4.3.1 Open-ended questionnaire

The first study was based on an open-ended questionnaire, with four questions, which was handed out in a classroom activity to a sample of 110 students in two schools in the Stockholm area (this questionnaire is presented in Appendix 1 and the two first questions were the bases for analyses, presented in Article I). It uses a ‘storytelling approach’ in that students, after reading short descriptions of authentic purchase situations, were asked to suggest explanations for differences in price of various pairs of goods and services. All students were asked to give their explanations for the prices of a train ticket and a flight ticket to the same destination and the price differences between other pair of goods; beef burgers, cotton socks, jeans, and personal computers. Finally, students were also asked what prices *should* be charged for travelling by plane and train.

4.3.2 Interviews and the interview guide

Along with the questionnaire used in the third study, which is presented in the next section, the longitudinal study included repeated interviews (the interview guide is presented in Appendix 2). These were semi-structured interviews with 16 students in the second year of upper secondary education, and the interviews were repeated a year later with 15 of those students. The students came from three different upper secondary schools, representing both urban and non-urban areas. Each interview lasted about 30 minutes. The first interview took place in mid-springtime and the second interview was performed one year later, when students were in their final semester of the business and economics programme. Each interview was formulated according to what Mishler (1986) describes as elaborated reasoning through dialogue in an informal setting between the interviewer and student. This means that the interviewee’s reasoning about specific issues was discussed along with personal experiences of purchasing the relevant goods and services. During the second interview, each student was also asked to state what he/she remembered from the previous interview. The interviews were carried out under the same conditions on both occasions, with the same interviewer, in the same schools and at the same time of the year. The interview questions and structure were also the same, featuring the same products and questions and focused on students’ conceptions about pricing of goods and services.

The open-ended questionnaire in the first study (Article I) did not explicitly refer to environmental impact when asking about prices, and not many students mentioned environmental aspects of price, hence this was made more explicit in the interview study (Article II). One of the paired goods was presented as environmentally friendly in the beginning of the interview, and before the final question on what the price *should* be, additional information was

given regarding the items' negative environmental impact and described climate change aspects of meat production. This information was presented in the form of short news articles collected from a Swedish NGO and one of the main daily newspapers. The information was chosen because it underlined some key impacts concerning environmental impact. Also, the texts were clear and easy to read for students (see the Appendix in Article II).

In the design of the interviews and analysis of students' understanding, it was important to minimise the risk of reducing the students' utterances into 'misconceptions' of scientific knowledge. The interviewer arranged each interview in a non-judgmental setting and informed the student that no one in the school would access the reasoning. The interviews explored the interviewee's thoughts and conceptions at a specific time, and this involved careful listening and the avoidance of interruption. A guiding principle for me, as interviewer, was to ask for additional descriptions and clarifications of answers.

4.3.3 The Likert-scale questionnaire

Individuals' value orientations, pro-environmental beliefs and personal norms (for behaviour) were investigated in the third study through a repeated survey (see Appendix 3, part D). It included a section of 13 value items that distinguish between egoistic, altruistic and biospheric value orientations, and the instrument has been validated in a cross-cultural study by De Groot and Steg (2007). Participants were asked to rate the importance of various values such as *equality* (equal opportunity for all), *authority* (the right to lead and command) or *helpfulness* (working for the welfare of others) on a 9-point scale ranging from 'opposed to my values' to the 'my most important value'. I translated the value items into Swedish and pre-tested readability with a group of students who were similar in age and educational background to the target group. The students were asked to comment in writing on unclear phrases and difficult wording (Van Widenfelt, Treffers, Beurs, Siebelink, & Koudijs, 2005). Students' comments showed no issues arising.

An additional section in the questionnaire comprised 27 items (see Appendix 3, part B35-C61) that evaluated the efficiency of markets' and governments' solutions to climate challenges. The items were modified from previous studies (Amadeo, Torney-Purta, Lehmann, Husfeldt, & Nikolova, 2002; Amnå, Ekström, Kerr, & Stattin, 2009; Ojala, 2007; Sinatra, Kardash, Taasoobshirazi, & Lombardi, 2012). Measures of beliefs about solutions' ability to reduce threats, and personal norms were chosen in relation to VBN theory (see Figure 2.). Nine items (see part B, 35-43) were selected for the analyses of beliefs and 11 items (see part C, 49-51, 53-58, 60-61) for the measuring of norms. The selection of beliefs regarding solutions' ability to reduce threats included, for example, phrases such as 'Consumers get education in greenhouse gases',

‘Producers get subsidies to become more environmentally friendly’, ‘Increased tax on greenhouse gas emissions’ and ‘Laws are initiated for allowed greenhouse gas emissions’. Norms were measured by propositions about individual willingness to act and what actions were desirable, for example, ‘I am willing to pay a cost for the negative environmental impact the goods I buy generate and thereby pay a higher price’, ‘I am willing to support political proposals on increased CO² tax for car petrol’, ‘Food prices should be higher if the products generate GHG (greenhouse gas) emissions’, and ‘It is the private companies that should solve environmental issues’. This selection of items was based on the distinction between the solutions relating to markets, regulation (governments) and information (Vedung, 1998). Answers were reported on a 4-point scale, ranging from *most negative to the statement* (1) to *fully positive to the statement* (4) that described various solutions to climate change. For nine of the items, the respondents had the possibility to express that they had *no opinion*.

4.4 Data analyses

The following section considers the analytical procedures of the qualitative and quantitative material.

4.4.1 Interpreting students’ written and oral responses

Interpretations and analyses of the written responses to the open-ended questionnaire, in the first study, are based on a qualitative content analysis (Graneheim & Lundman, 2004; Weber, 1990). The choice of method was motivated by the objectives of exploring if and how students conceptualised negative environmental effects when explaining price, and preferences for what prices of goods and services should be. All written responses were read and reviewed carefully several times with the intention of identifying each individual’s reference(s) to the use of natural resources and negative environmental impact in relation to price of each of the goods in the sample. The references were transcribed and categorised relative to what environmental content the individual identified, and in relation to previous research findings (see section 3.1) on the understanding of price in terms of an intrinsic value, productivity (referring to supply), consumer preferences (referring to demand) and both supply and demand. The written categories were then discussed by co-researchers to verify that data were consistently sorted. The same analytical procedure was followed for written responses on what prices *should* be. The analyses were then presented and scrutinised at research seminars, international education research conferences and by journal reviewers.

In the second study (Article II), all interviews were recorded and transcribed by me with the help of two experienced assistants. The transcripts were read several times and systematically and manually coded into meaningful themes in relation to the research objectives (Braun & Clarke, 2006), and the term 'meaningful' can be seen as a matter of appropriateness in relation to the research aim. Here, the aim was to identify and characterise changes in students' conceptions of negative environmental effects and pricing, therefore the analysis focused on the characteristics of students' reasoning. The analytical procedure followed the same deductive approach as in the first study (Article I), being framed by earlier research and categories of understandings of price in terms of an intrinsic value, productivity (referring to supply), consumer preference (referring to demand), both supply and demand, as well as externalities. However, the interviews also aimed to enable more elaborate responses compared to the initial written ones from the first study, which restricted responses to a few written lines. The interpretations of interviews were inductively settled as students' reasoning varied, being more or less complex, and were classified as sub-themes. As a final step, the themes and responses were compared for each student between the first and second interview in order to identify and characterise changes. The results of the analysis were then discussed by the co-authors of Article II until agreements were reached in line with our recurrent inter-reliability process. Also, the analysis was presented and scrutinised at research seminars, international education research conferences and by journal reviewers.

4.4.2 Analysing values and beliefs

SPSS (version 21.0) was used for the quantitative analyses. The quantitative data provided evidence of (i) value orientations, (ii) beliefs about the economy's ability to reduce threat, and (iii) norms regarding personal commitment (e.g. willingness to pay higher prices due to CO² tax) and the use of different policy instruments. Since the items used for value orientations were taken from De Groot and Steg (2007), it would have been possible to assume that their categorisation of items would have held for the sample in this research. However, this sample was quite different from the one used in their study, which included only a small number of participants from Sweden and the age range was different. Therefore, exploratory factor analysis (EFA) was used to generate a set of categories (by data reduction) that reflected the patterns in the data for this study. Maximum likelihood extraction with a direct oblimin rotation was used to take account of possible non-linearities in the data. Items loading less than .40 were excluded and factors were identified with eigenvalues higher than 1.0. Multiple-loading items were placed with those items that had a similar content area and where highest reliability was generated. Means were calculated for each extracted factor. A score over 4.0 (for values) and

over 2.0 (for beliefs) suggested more positive preferences of the students. Reliability statistics presented a Cronbach's alpha (CA) for the factor extractions for biospheric value orientation of .80, for altruistic orientation of .70 and for the egoistic orientation of .64. The CA-values for beliefs and norms factors was between .73 and .84. With reference to George and Mallery (2003), the internal consistency was found to be good or acceptable for almost all factors (the authors hold a CA of .9 to be excellent, .8 to be good, and .7 to be acceptable).

In exploring values and belief change/stability, a paired sample t-test ($N=142$) was used. To obtain a complete data set and handle missing data, I conducted multiply imputation which estimates and fills in a value for each missing value (M) times; and the variation between the (M) imputations is used to estimate the increase in variance due to non-response and imputation. From this procedure standard analyses are possible to perform on each of the (M) data, and five (M) imputations are usually sufficient (De Waal et al., 2011; Pigott, 2001). The data set showed 9% incomplete values from the students at the T1-measure of values, beliefs and norms and 4% incomplete values were reported a year later. More specifically, 46% of the informants failed to report one or more variables in the first year and 37% in the second year. The imputed sample took the mean of the estimates for the missing values and data analyses were conducted and described for the non-imputed as well as multiple imputed 142 participants. The outcomes of the non-imputed and imputed data were sorted and compared in order to make qualified estimations for the full sample.

To examine change in values, beliefs and norms over the year, I used a paired sample t-test, which is a significance-test comparing the means of two variables of the same individuals at various times to evaluate if the differences in means is statistically significant. More specifically, it determines whether there is a non-random difference that reflects a systematic difference between a pre-measurement (T1) and post-measurement (T2). To grasp individuals' particular values a cluster analysis with K-means method was conducted. The outputs were then compared between T1 and T2 to see whether individuals had changed over time. Finally, to examine the associations between norms and beliefs and value orientations Pearson correlation analysis (Pallant, 2010) and a multiply linear regression, OLS (ordinary least-squares regression) was conducted (Hutcheson, 2011). Furthermore, a difference-in-differences analysis was set up to see if change in norms was associated with change in value orientation or changes in belief.

4.5 Methodological reflections

The previously presented theories, central constructs and empirical literature derive from different research traditions, including post-positivism and constructivism, which build on different philosophical foundations of how to perceive the nature of reality and gain knowledge about the world. As noted above, various worldviews imply diverse approaches to recognising the role of values in research and how research processes are conducted. Furthermore, this generates different methodological implications regarding how and what objectives can be studied. Traditionally, qualitative and quantitative research are separated from each other on the basis of how data collection-procedures and analyses are built. The research traditions discuss quality using different vocabularies in relation to the different methodological and ontological stands that each tradition takes. Terms such as validity and reliability are used when judging the qualities of quantitative studies, while qualitative studies often use terms like credibility and transferability. Therefore, as mixed methods research involves both research traditions, there are arguments aligned with various terms for the discussion of validity. I will, however, only use the term *validity* to refer to the quality-procedure, since it is a commonly used term and understood in both research traditions (Creswell & Plano Clark, 2011). The overall ambition of this section is to highlight three points concerning the quality and limitations of; i) data collection and analyses, ii) sample size and iii) generalisations.

The use of interviews with students raises the question of whether interviews can really expose students' conceptions. More specifically, one can argue that the relationship between what is said by the student about her/his beliefs or conceptions might not completely mirror her/his knowledge. The cognitive research tradition (such as conceptual change research) has been criticised for not taking account of the situation and the co-construction of meaning in, for example, an interview setting (Jakobsson, Mäkitalo, & Säljö, 2009). In essence, the objection is that it is not possible to decide on an individual's conceptions by not taking account of the specific practice. Halldén, Haglund and Strömdahl (2007, p. 26) add an important contribution to this concern when stating "the fact that there is no instrument that we can use to *directly* observe conceptions does not in itself imply that nothing of value can be said about how people conceptualize the world" and they present an analytical tool, 'intentional analysis', for interpreting conceptions. Furthermore, I argue along the lines of Brinkmann (2014, p. 1009) that,

“...the fact that the person of the researcher is the research instrument is actually a virtue of interviewing and arguing that interviewing – due to its dialogicality – may be the most valid research instrument to study qualitative, discursive, and conversational aspects of the social world”.

In the analysis, I have used my teacher experience of conversations with students and of the process of qualifying and tracing students' ideas regarding social and environmental matters. Secondly, the analysis naturally builds on and applies scientific views of the material that are relevant to the research interest such as economics (e.g. price mechanisms and externalities). Thus, the interest in students' understandings departs from the presupposition that individual's mental representations (here seen as understandings) can be interpreted from what he or she says, or does (Vosniadou, 2013). From this perspective, it is relevant to find out what interpretations are brought forward by the student and in relation to the specific subject for thinking and her/his interpretations of the context.

A common critique of both interview and survey studies concerns 'too small sample size' and 'too much missing data'. Guest, Bunce and Johnson (2006) argue that fifteen participants is the smallest acceptable sample. However, research does not provide clear empirical evidence for such guidelines and it appears that interviewees provide little that is 'new' after 20 people have been interviewed (Green & Thorogood, 2009, p. 120). Furthermore, Lee, Woo and Mackenzie (2002) suggest that studies that use multiple interviews with the same participants (e.g. longitudinal studies) require fewer participants and, from this, I conclude that repeated interviews with 15 students (as in the second study) is sufficient.

The issue of sample size in the third study takes the research aims, type of planned analyses and the nature of the data into consideration. About 40 participants could not be identified and matched from the first study – either they were new participants or used different names. This can be seen as a fragility in the research process as it reduced the possibility to compare the individuals' responses over time. However, there were no statistically significant differences between value orientations, beliefs and norms of the group that only participated in T1 and the group that did both T1+T2. If the participants only in T1 had also participated in T2, I believe it is reasonable to assume that their response would have been similar to the T1 and T2 participants. I therefore maintain that the results can be treated as reflective of the whole sample ($N=12$). A criticism can be raised with regard to how missing values in the questionnaire are handled; one might ask if it is fair to ascribe a value to an 'empty' item in the survey according to the sample's average response. The strategy used here provides a reasonable assumption of what the students

might have responded and increases the external validity (see the previous section on the multiple imputation procedure).

An additional problem with repeated data gathering is that students may try to respond in line with the first measurement with the intention to be consistent. One strategy to find out if this was the case was to add two follow-up questions to the end of the second survey (T2) and ask if students also participated in the previous survey and interview (T1). From the 142 students that were identified as participants during both surveys, 14% ($N=20$) stated, for some reason, that they had only participated once, namely in T2, although this was not the case. During the second interview each participant was also asked to state what he/she recalled from the previous interview. All students remembered the interview however its topic was less clear.

Factor analyses are used to reduce and relate items in the values, beliefs and norms instruments. These analyses tend to show that the stronger the data output is, the smaller the sample. This emphasises the need for high commonalities without cross-loadings (between factors), together with strong loaded variables for each factor. Although there are few firm rules on this matter, one strategy is to relate a minimum number of subjects-to-item ratio. A large part of factor analyses research uses less than a 10:1 subjects-to-item ratio (number of participants in relation to the number of questionnaire items) for the determination of a sample size (Costello & Osborne, 2005). In this thesis, this strategy generated a considerable subjects-to-item ratio, ranging from 11:1 to 15:1 for the three construct measures of 13 value items, 9 belief items and 11 norm items, when the sample size was 212. This was interpreted as a good rationale for conducting factor analyses in the third study (Article III).

The generalised inferences made in the quantitative study are built on the model that generalises findings to a wider population. However, this assumes a random sampling from the population in focus (in this case, this would require a sample representing all Swedish upper secondary school students in the business economics programme) and every member of the population would have an equal chance of being included in the study, however, this must be seen as a “goal to be achieved” (Polit & Beck, 2010, p. 1452), while it is more often the case that researchers have an accessible group from which participants are sampled. For the longitudinal studies, data were gathered from a judgment sample of nine schools. This was based on four principals (see section 4.1) linked to the research questions and the practical implications of gathering data in a large geographical area over time.

The applicability of research findings can be considered in relation to *analytical generalisation* or to *empirical generalisation* (Yin, 1994). Analytical generalisation is useful for the understanding of qualitative research, which aims

to provide rich, and contextualised understanding of experiences through studies of the particular. Rather than ascribing generalisations to a population, findings can be understood in relation to the phenomenon of study (Polit and Beck, 2010). In this thesis, this is in relation to conceptual change/framework theory and interpretations of students' conceptions of pricing and externalities and changes in conceptions over time. From this, the findings (see Result section 5.1) of environmental connections to pricing, as *basic*, *partial* and *complex* conceptions of production together with findings of *basic* and *partial* conceptions of consumers' demand is understood in the light of analytical generalisation to theory of conceptual change. Also, Polit and Beck (2010, p. 1454) suggest, "Knowledge grows through confirmation". In relation to the current findings, this would suggest, for example, replication of sampling and replication of the studies.

I have presented arguments for the design of the project, the time factor, the same sample and data collecting methods, but these can also be discussed in terms of their methodological problems. Multiple measurements increase the risk of changes in the sample group, i.e. loss of responses. This might be a problem if the number of participants were reduced to the extent that it would jeopardise statistical significance. Also, participants might only once show differences compared to the others, and this could potentially be the most relevant to report. In Article III, the study was built on participants from ten different classes in nine different schools. In the repeated questionnaire, only eight of the initial classes participated. This is handled through the described method of multiple imputation for missing data and separate analysis for students in the one-time participants (T1) compared to the two-time participants (T1+T2).

4.6 Ethical considerations

At the beginning of the data collection, students were informed both verbally and in writing about their protected anonymity and the importance of voluntary participation, as well as the chance to withdraw their engagement at any time. However, this right was not exercised by any of the students in the first and second study and, altogether, less than a handful of students wished to be excluded from both the longitudinal questionnaires. Furthermore, it was important to stress the voluntary principle to the students, since data collection took part in ordinary lessons. In this way, teachers acted as gatekeepers to the research project, and students were assured that the teacher was not going to evaluate, or in any other way have access to collected data (Gregory, 2003; Gustafsson, Hermerén, & Petersson 2011). A possibly critical position in the data gathering process concerned how the students were going to understand

the research project correctly and how findings would be used. It was important to help them understand the context in which the data would be presented and used, and therefore each data collection session initially presented the research's interest. A short description of research specifics on the longitudinal method was given and the students were informed that the results were going to be presented and published in an academic book/format. To more clearly exemplify what a thesis can look like, an example was distributed to the class. This procedure was a part of gaining informed consent of the attendees and this introduction ended with a reflective session where students were given the opportunity to ask questions about the survey. I gave them my contact details in case there were any questions and comments that arose after the session. A general interest was expressed among some attendees about what it was like working as an academic researcher.

5. Results

The following results section is guided by the research questions that were presented in the introduction. The first question concerns how students conceptualise environmental degradation in relation to the prices of various goods and services, and what changes and stabilities are shown in their beliefs regarding how environmental degradation is reflected in price and how it *should* be reflected in price. This was the focus of Studies I and II. The second research question concerns relations, and what changes and stabilities, in students' value orientations, beliefs and personal norms regarding how climate change should be solved, which was the focus of Study III.

5.1 Conceptions of price in relation to environmental degradation (Articles I and II)

The study presented in the first article was conducted with the intention of investigating if and how upper secondary school students conceptualise a link between price and environmental impact. An open-ended questionnaire was distributed to students and the participants were asked to describe how pairs of similar consumer goods may obtain different prices, as one item was described as being more expensive than the other. The items presented to the students varied between beef burgers, bottled and tap water, cotton socks, jeans and personal computers. Also, all participants elaborated on flight and train services between Stockholm and London. These products were chosen on the basis of the available evidence on their negative environmental impact during production and/or consumption, and on the basis that flight trips to London were familiar to the students, i.e. they could draw on their own experiences.

The findings show that relatively few students (13%) considered environmental impacts in relation to how prices are set. Furthermore, there was a variation in environmental considerations among students in relation to the specific goods and services. Some items were seen as more environmentally damaging than others. For example, jeans were not perceived as having negative environmental impact (although they have), while beef burgers, cotton socks

and travel services were to some extent described in terms of negative impact. More specifically, the environmental dimension of a student's conception of price was most often characterised according to the *perceptible aspects* of the goods. The varying conceptions relating price to the environment were for example, '*environmentally friendly is an intrinsic quality of a more expensive good*', '*environmentally friendly products are more expensive to produce*' and '*some customers are willing to pay higher prices for products they believe are more environmentally friendly*'. In this last sentence, a student described an aspect of cost in terms of environmental degradation. This became evident through consumer demand rather than the producers' cost of supply. One student advanced the argument that some environmental degradation effects may be incorporated in the supply price, while also recognising the existence of externalities and the possibility that some consumers will be willing to pay more for eco-friendly products.

In addition to investigating students' conceptions of price and the environment, the first study included a value aspect and explored pricing by probing how prices normatively and 'judgmentally' *should* be set. The object for students' reasoning was a train and a flight service. The results showed that almost 40% of all participants in the study included some reference to negative environmental impact in their beliefs about how prices should be set. These beliefs showed a distinction between two qualitatively different instances where students argued simply that '*prices should be higher to reduce environmental effects*' and instances where students explicitly argued that '*when prices reflect negative externalities, this will reduce demand and production leading to a more efficient outcome*'. An important finding here was that students more frequently seemed to display views about the consumer, or consumer demand, in relation to price when the question of what the price *should* be was answered.

The study in the second article was conducted through a longitudinal design and with the ambition of finding changes over time in students' conceptions of how environmental issues *are* and *should* be reflected in price. The students were presented examples of environmental degradation related to the goods in focus before presenting how prices ought to be. This design was opposite to the design of Study I, where the goods and services were not described as having negative environmental impact. Furthermore, the second study explored how students' conceptions changed over the course of a year, during the two final years in a business and economic education programme.

The result identified the fragmentary nature of students' everyday reasoning and its differences to a scientific explanation of prices in relation to productivity, consumer preferences and externalities. Students' conceptions were characterised in terms of being *basic*, *partial* and *complex* in relation to how

productivity linked to negative impact. The partial conception was characterised by an initial idea of relationships between productions however not explicitly thinking in terms of productivity: the relation of inputs to outputs. It also identified and characterised basic and partial conceptions of consumption. The characteristics of partial conceptions were interpreted as being students' conceptions in a process of change towards a more scientific understanding of relationships between price and negative environmental impact.

In regard to aims of business and economics studies aiming at improving students' understanding of price by developing integrated thinking about supply and demand, the study found only limited evidence of success in this regard. Findings showed some indications of development in students' thinking about the impact of productivity on price. However, even those changes appeared to be still at an uncertain stage of transition from a more simple to a more complex understanding.

Furthermore, most students (eleven) once made environmental references for how prices are set by including *partial* conception of production. The only stable conception (showed at both interviews) of environmental aspects within the description of prices was showed from few students as partial understanding of production. Most interestingly this study identified expressions of links to externalities. This was expressed with references to production, for example shown by references to the economic (market) system as encouraging 'cheap' production, whilst the environment is '*something you have to pay for*'. Also, ideas of consumers internalising externalities were expressed, such as '*if one thinks more of the effects from the emissions, one takes care of lots of things and that influences the price*'.

Another important finding was that more than one aspect of environmental impacts and pricing, seemed to be simultaneously relevant to the individual in the interview. This was exemplified by a change from views putting productivity at the centre to include consumer preferences when judgmentally describing how prices should be set. The findings showed that students' conceptions connected more frequently to consumers' preferences for prices when the question on *should* was presented, and before the information on negative environmental impact was given. The conceptions were for example; '*People should value eco friendliness and they should pay a higher price*' or '*People prefer to buy less expensive goods therefore eco should be cheaper*'. The findings also identified a more elaborated theme of consumers' impact in relation to prices as in '*People should value eco friendliness when they get information of the negative impact and price will be reduced since high demand reduces the price*'.

Finally, the findings suggest that students' everyday thinking about how prices are set, and how they should be set, develops towards a scientific view along separate pathways, and there is variation in changes among the students over time.

5.2 Values and beliefs regarding climate change solutions (Article III)

The third study (Article III) is a longitudinal study and used the Stern's (2000) 'Values-beliefs-norms' theory to examine willingness to take 'pro-environmental' actions (see section 2.2). The theory proposes causality between the variables where beliefs are mediating elements between value orientations and the stance that individuals adopt towards environmental problems. The focus here was on changes in students' values, beliefs and norms concerning the efficacy of various responses to environmental problems such as climate change. The study examined changes in relationships between the constructs when questioning the efficacy of government and market forces to tackle climate change (for a full presentation of instrument and method, see Chapter 4.)

Value orientations were measured in a scale distinguishing between altruistic, biospheric and egoistic orientations and the findings supported the three factors. Students responded by rating how important various value-items such as 'ambitious', 'equality' and 'helpful' were to them (see Appendix 3, part D, presenting the value instrument's items). The factors extracted (through Explorative Factor Analysis) from the value measurement showed differences in specifications of how various values were allocated compared to the original measurement by De Groot and Steg (2007, 2008). Only two of the original five value items were allocated to the egoistic value orientation restricting this to a 'power' perspective while material gain ('ambitious' 'influential' and 'wealth') was more associated with an altruistic orientation. The results showed that the altruistic value orientation was the strongest value over time and egoistic orientation the least strong. A significant change in value orientation was found in terms of average strength (measured on a nine-point scale from 'opposed to my value' to 'the most important value') for all orientations. The strongest intensification was found for the biospheric value orientation however all observed average changes were modest. The imputed data confirmed this result however when using the original categorisation of items there was no change in average strength for biospheric value orientation.

In order to gain a more accurate picture of value change, cluster analysis was used to investigate individuals' shift in orientations. The analysis allocated

students into three clusters at each point in time, T1 and T2: weak values, strong altruistic and biospheric values and strong values. The proportion of students expressing strong value orientations increased over the year from 48 to 70 whilst the proportion expressing weak value orientations halved from 34 to 17 students. The proportion expressing low egoistic values was stable over time. Most interestingly, about 60% of the individuals changed cluster over time and this was observed in the multiply imputed data too. To conclude, the findings of value changes suggest that, on average, students' value orientations changed with a small increase in strength in each orientation. At the individual level a great variety of shifts between value strength clusters was shown.

At T1, students expressed more confidence in tax and legislation than education and market prices as a means for policy to solve climate change whilst the belief in the efficacy of market prices decreased over the year. Furthermore, the norms clearly distinguish between two different aspects of personal norms; *my individual environmental action* and *governmental and business environmental actions* to solve climate change, where the later aspect was seen as more preferable to students. At T1 the strongest average (norm) disposition was towards governments and business taking responsibility for action on climate change while there was no change over the year in average dispositions of the norms. However at individual level norms changed. For example there was a disposition towards a willingness to reduce consumption, accept higher prices and accept higher taxes. The regression analysis showed that the orientation towards biospheric values at T1 was positively associated with willingness to change (reduce personal) consumption and to accept higher prices. Interestingly there was a positive association at T1 between a belief in the effectiveness of the price mechanism, the likelihood of support for higher tax (that would work through the price mechanism) and the likelihood that a student would regard action on climate change as a responsibility of government. This raises a question regarding the potential for education to influence students' personal norms regarding action on climate change.

According to the VBN model, the scope for education to influence stance towards action on climate change depends on the possibility of individual change in value orientation and individual change in beliefs about the efficacy of causal mechanisms initiated by personal or policy action. A difference-in-difference regression analysis was used to examine these possibilities. Interestingly, this suggested no direct relationship between change in norms and change in value orientations. However, there was an indirect association mediated by changing beliefs in the efficacy of education and information and the efficacy of tax policies. For example, students who became more egoistic and more convinced about the efficacy of tax were less likely than others to

be willing to take personal actions. Also, there was a direct association between a belief change about tax modifications as efficient solution to climate change and the (norm of) willingness to accept higher prices.

Furthermore, an important notice in regard to the results is that there were no significant differences between value-beliefs-norms for the T1 participants and T1+T2 participants. If all T1 participants ($N212$) had participated in T2, it is, therefore, reasonable to argue that their response would be similar to the main participants ($N142$) and based on this procedure results can be treated as reflecting the whole sample ($N212$).

5.3 Summary of results

This thesis shows differences between scientific and everyday conceptions of pricing in relation to environmental degradation. These conceptions vary according to the item (good/service). Students are more likely to refer, in qualitatively different ways, to production aspects than consumption aspects concerning how prices are set. An important finding is that, when students were asked about how prices should be set, it revealed more of consumer-related aspects of pricing. Students showed a broader content knowledge regarding pricing and the environment when including normative preferences.

Although conceptions of how prices are determined and how they should be determined were separated into categories with a similar structure, students tended to be inconsistent in their conceptions. Changes in the individual's conceptions were characterised as being in a state of flux and, even after studying business and economics, students' conceptions - *basic*, *partial* and *complex* - seemed to fluctuate regarding the content matter.

The findings showed changes in average strength of value orientations between T1 and T2 when using the items' allocation of the factor analysis conducted in the current study. Value strength increased with a modest effect size in each case (altruistic, biospheric and egoistic value orientation) and this was confirmed with the imputed data. However, when using the original instruments' allocations of value items the findings showed no change in the average strength of biospheric value orientation. Furthermore, it was shown that individuals' value changes in terms of movement between *weak values*, *strong biospheric and altruistic values* and *strong values* were very common.

Taxes and legislations were seen as the most effective solution to climate change while students perceived changes in the market prices as being least effective. The observed changes in students' beliefs in the effectiveness of solutions were very small over time, and were manifest as decreases in market

prices merit to solve climate change. Regarding norms, there are individual changes however no average changes over time and the norms seemed to be split into two different aspects of personal norms; *my individual environmental action* or *governmental and business environmental actions* to solve climate change. The strongest norm over time is observed in relation to government and business being responsible for solutions. Changed consumption is the least strong norm even though students adjust to a willingness to pay higher prices. In relation to the VBN theory, the findings showed no direct relations between changes in norms with change in values however, changes in norms were associated with mediation of value change through belief change. This was for example showed through students who became more egoistic and more convinced about the efficacy of tax were less likely than others to be willing to take personal actions. Also, there was a direct association between a belief change about tax modifications as efficient solution to climate change and the (norm of) willingness to accept higher prices.

6. Discussion

The aims of this thesis are two-fold. First, the aim is to identify and characterise changes in business and economics students' conceptions of negative environmental effects and the pricing of goods and services. Secondly, to identify and characterise changes in environmental values, beliefs and norms regarding effective solutions to climate change problems. The following sections will depart from the overall questions, and discuss the main findings of the thesis in relation to earlier research. The final sections include conclusions regarding the methods used, the generalisability of the findings, and the implications for practice, policy and future research.

6.1 Changes and stability in conceptual content

The first research question probed how students conceptualised environmental degradation in relation to the price of goods and services and what changes were shown in conceptions of how prices reflect, and *should* reflect, environmental degradation. The overall findings identified similar conceptions of price as did earlier research, for example, Pang and Marton (2005). These describe students' conceptions of price as being (i) the intrinsic value of a product, and findings here show that *environmentally friendly* is a characteristic of a good and perceived as the intrinsic value, (ii) demand for the product, (iii) supply of the product, or (iv) the effect of both demand and supply on price. However, reasoning along the lines of the second and fourth categories was partly shown when students considered how prices were set. These findings are in contrast to findings by Siegler and Thompson (1998), which showed that very young children recognised demand when related to change in the amount of available goods for sale and before an understanding of supply-related changes. It is here shown that conceptions of consumer preference as a price-influencing factor are in their infancy. The diverging results could perhaps be explained by the fact that there were different goods in focus. The results suggest that the students saw some items as more environmentally linked, e.g. burgers, cotton socks and travel services, than others, such as jeans. One could also argue that the students' experiences of being a consumer of these goods do not provide more qualitative understandings of pricing. Furthermore, this thesis describes students' *partial* understanding, which is the

emergence of for example ‘negative externality’ within a process of gradual development. From an understanding of productivity and its costs generating a good’s price, to a tentative understanding of environmental cost, which is partly or not at all included in the price. These conceptions can be seen as students’ explorations of various circumstances - an elaborating approach - and they seem to be rational explanations (to students) of pricing for the moment.

It is notable that most of the empirical studies focus on children’s and economics undergraduates’ understanding of pricing, while students’ understanding of economics and the environment have received limited attention. Also, conceptual change research has paid little attention to economics learning, as to the social sciences overall. As mentioned earlier, this dissertation aimed to address this paucity of research by describing the conceptual formation. It has been shown that changes in individual conceptions of pricing and negative environmental impacts vary at both a one-time measurement and over time. This aligns with the findings of Larsson and Halldén (2010) that showed how children held two parallel ideas about the shape of the earth, and that these were integrated into one, over time. This is understood as one of two kinds of conceptual changes, while the second change means that children differentiate the initial idea.

6.1.1 How should prices be set?

An example of holding parallel conceptions of pricing and environmental impact was shown in this project’s first and second articles in relation to the question of how prices *should* be set. Almost all responses included references to consumers or relations between consumers and demand to influencing pricing, while most just pointed to production when they described how prices *are* set. From this, it is reasonable to conclude that students’ more extensive understandings of how prices are set can be revealed if both questions are asked.

At least two critical questions can be put forward with regard to the results of students’ parallel conceptions. The first one concerns if differences in conceptions reflect the individual’s conceptual change or simply the questions being asked. In particular, the *should* question can be seen as a type of intervention, while this type of question is normative in its character and does not predominantly search for descriptive responses. The second question concerns if there might be additional and essential conceptions that have not been brought forward with the current design. Regarding the first of these questions, the findings showed that students responded to the same problem in varying ways and this would most likely not be the situation if interview questions directed students to express only one type of conception. It is suggested that the learning

process is not a solid and straightforward conceptual change process (from A to B), which early conceptual change research has suggested. Findings here rather bring forward and describe the process of change that is instable, in a flux, and including ‘stepping stones’ – partial conceptions. More specifically, the present findings recognise the twisting and winding process of coming to ‘settle down’ with an understanding. An individual’s parallel conceptions are here seen as a snapshot of this winding process, and reachable through the use of both descriptive and value-laden questions to students.

In Article II, the participants were asked two times during the interview to elaborate on what prices *should* be. On the second occasion, each student was shown short informational texts about the negative environmental impact of beef consumption and production. One problem of using informational texts is that the findings can be seen only as artefacts of the research method that facilitates certain responses from the students. Briefly, the situational impact may affect or explain the results implying that the individual’s own conceptions cannot be fully grasped (Jakobsson et al., 2009; Schoultz, Säljö, & Wyndhamn, 2001). However, accepting that some students may see the interview questions and the supplementary information as giving them ideas of how to answer ‘appropriately’, it is reasonable to suppose that students might also present their own extensive views not shown earlier. This was the explicit intent with the current interview design; to encourage elaboration specifically on environmental impacts and asking questions focusing on both explanations and preferences concerning social phenomena.

The use of the *should* question in interviews can here be seen as an approach for researching conceptual understanding as well as investigating norms for how things should be. The warm conceptual change perspective highlights intentional and motivational factors in the process of learning. Furthermore, Sinatra (2005) discusses several mediating constructs such as values in the conceptual change process and describes them as ‘warm constructs’ which underline that there is more to consider than ‘cold’ cognition when learning is at stake. One way of exploring values in relation to conceptions of price was conducted by posing a value-oriented and normative question to students in the interview. Asking the students about what prices *should* be might have generated extra interest and concern – a motivation – to answer and further elaborate on answers, compared to when simply being asked how prices are set. Students’ explanations thereby provide additional knowledge and insights. For example, *consumers’ demand influencing price* was more often given as an explanation compared to when students were asked how prices are set. Another important finding is the tentative understandings of externalities that students showed in relation to how prices should be set. Posing questions to students that made them draw on their individual preferences provided them with an opportunity to answer as moral subjects whose values and norms were

of specific interest and which therefore might have prompted them to elaborate more on their responses.

6.2 Changes and stability in values and beliefs

With regard to the second research question, this section will discuss changes in students' value orientations, beliefs and personal norms regarding how climate change should be solved, and to what extent there were changes in relations between them. Stern (2000) identified altruistic, biospheric and egoistic value orientations to frame individuals' environmental behaviour. More specifically, values are seen as the framework for the actions mediated by beliefs and personal norms. Most often these constructs have so far been referred to as attitudinal objects, which has neglected the relevance of specific beliefs (*of how things are related*) and norms (*standards or obligations*) for explaining individuals' behaviour. Behaviours in this thesis were studied in relation to large-scale collective action and individual action. The findings showed that changes in value orientations were found in terms of increased strength to all orientations, however biospheric values increased most. This is in line with findings from a study on university students as respondents. Here the same value instrument was used and the study showed a small increased strength in orientations (Torbjörnsson, Lundholm and Harring, 2017).

Research suggests that adolescence is a critical period in individual's value-formation and environmental sensitivity and critical in the sense of being able to reach a stable value position in adulthood (Chawla, 1999; Hofmann-Towfigh, 2007; Schwartz, 1994; 2005; Vecchione et al., 2016). The absence of strong value shifts/changes in this study could be related to when in time the measure was conducted. It might be that in mid-spring time - a few months before finishing school is not sufficient time to study value changes. A later point of measurement, at the end of the final semester or at the beginning of the autumn, might have shown other changes.

The findings concerning students' views on solutions highlight dimensions that bring politics and the market into focus. Previous research addressing solutions to environmental degradation has often examined individuals' specific behaviours, such as recycling or buying 'green goods', so called 'direct pro-environmental behaviour' (Kollmuss & Agyman, 2002, p. 249). However, research in the domain of political science has shown evidence of the need to address environmental problems, such as climate change, in terms of collective action problems (Mansbridge, 2014). The findings here showed that taxes and legislation were perceived as effective ways to mitigate climate change. The market mechanism (market prices), were seen as the least effective and,

in addition, this factor decreased in importance over time. This is in line with the findings of Haring, Davies and Lundholm (2017), who examined university students' support for various policy instruments to solve environmental problems, i.e. taxes, subsidies, regulation and information during their first semester of economics studies. Their findings showed that students became more supportive of subsidies and taxes while being less supportive of solutions such as regulation and information. Although there was not a clear outset in Article III to explicitly explore attitudes to policy measures, it is reasonable to argue that the findings would have been similar, as the students thought taxes were an effective means of solving climate change. In conclusion, all these measures are governmentally implemented, and students might have been advocating limited measures or actions by business and the market when it comes to solving large-scale environmental problems.

Furthermore, it was found that there were no average changes in personal norms over time, though government and business were perceived as being mostly responsible for solutions, and this was the strongest norm at both T1 and T2. This combination of two very different actors - government and business - is interesting and raises the question of whether students are unaware of the contradictory stands these actors often take, for example, in economic and political contexts. However, could it be that, in relation to solutions to climate change, which students might see as an urgent issue to solve, they do not find it relevant to highlight such differences? It might seem more relevant for students to distinguish between two sets of norms for behaviour, which relate to 'my individual action' and 'governmental and business actions'.

According to Heimlich et al. (2013) and Sen (1987) values are central and most important in relation to the environmental and economics subject specifics since most often, this content can be perceived as value-laden to individuals. Also, a value dimension in these subjects concerns how individuals and societies should be organised regarding the environment and pricing. Therefore, it makes sense to explicitly ask questions about how things *should* be arranged in relation to this value-laden content. To what extent values and norms are made explicit to students in their environmental and economics educations have not been in focus here. However, there is potential in the current national curriculum for such a focus, as it should "provide knowledge (to students) about the conditions for sustainable development, not only from environmental but also economic and social viewpoints." (National Agency of Education, 2012, p. 197).

6.3 Students' background and experiences

Students' conceptions can be seen as context-bound in their daily experiences of buying and the results of this thesis show a great potential for the school subject of business and economics to teach environmental understandings in these contexts. All students included in the interview study had experienced buying beef burger, which underlines an experience of being a consumer rather than a producer, however this later 'actor' were more often highlighted in students reasoning. Also, more than half of the questionnaire participants had an extra job in addition to schoolwork, received the study allowance and bought their clothes. One could think of several examples where such experiences could influence every day understanding of price relating to demand. Torney-Purta (1994, p. 118) stressed the importance of individual experience: "everyday experience and cognitions situated outside the classroom is widely influential in the domain of social and political knowledge." This raises the question of whether changes in conceptions are associated with social, political and cultural changes between the times of measurement; in other words, what external events and contexts can be considered in relation to change? It is worth noting that the research was conducted in the aftermaths of the international economic and finance crisis of 2007/2008. These events were given large media attention and it is reasonable to assume that students more or less considered economic causes and consequences regarding the matters (Aprea & Sappa, 2014). Other factors concern family, friends and the wider social context of which the individual is part. It can also be seen in relation to teaching and learning contents and methods, and specifically highlights the question of what economic and environmental subject-specific content students have possibly elaborated on in school.

Very few students could recall specifics in relation to environmental impact and/or costs when I asked them if this had been highlighted in their education. This does not mean there had not been such teaching and/or that they did not remember this clearly. However, it is reasonable to consider the possibility that business economics textbooks and curricula are not very detailed in this matter, which would be in line with Naughton's (2013, p. 95) findings regarding various college economics textbooks. He concluded that, "The standard coverage of externalities might imply that consumers do not cause negative externalities or that producers do not cause positive externalities."

6.4 Linking the results of the three studies

This thesis comprises data collected independently and presented in three different articles. The following discussion focuses on links between the theoretical frameworks and the empirical findings regarding students' conceptions, values, beliefs and norms.

A central focus in all the studies concerns asking students how things *should* be regarding pricing and solutions to climate change. In the interviews (Article II), many students responded to the normative *should* question by saying that negative environmental impact should have a cost and goods should thus have a higher price; a common explanation for this was that this would lead to a decrease in demand for environmentally negative goods and services. Thereby, the responses to the question of *should* include students' normative views followed by descriptive aspects of pricing and negative environmental impact. They are descriptive in the sense that the responses describe ideas about causal relationships and the structure of how things are, as the background for how to respond to a question of *should*. In Article III, students' responses to the questionnaires are in line with the above, suggesting effective solutions in regard to market prices (e.g. where demand affects price), and further shows a personal norm concerning prices, which should internalise externalities and therefore be higher. Interestingly, students were willing to pay for these internalised externalities, although when compared to other solutions to climate change, taxes and legislation were, over time, perceived as more effective.

A link between the three studies can be seen in relation to the two theoretical strands upon which this project draws. In this thesis, the construct of conception is seen as part of 'framework theory' and relates to the value-belief-norm theory; it connects the idea of 'framing' conceptions with an overarching framework and 'framing' beliefs through overarching value orientations. In both these research strands, there is an interest in the influence of values on beliefs and knowledge development. In the latter, it has been termed the 'warming trend' (Sinatra & Pintrich, 2003). However, there is an important difference in the VBN theory, which emphasises the framing by value orientations and 'how things *should* be' and the framing in 'framework theory' by a sense of 'how things *are*'. It is this that enables a meaningful distinction between beliefs about 'how things are' and personal values of 'how things should be' in the VBN framework. There is no clear equivalent in the framework theory to personal norms in VBN, however, here, the normative *should* questions posed to students in Article I and Article II, display a central link to the values and personal norms expressed in Article III concerning solutions to

climate change. Also, conceptual change research has not focused on how knowledge influences behaviour, which is of central interest in VBN theory. There is also a connection between the belief construct and the conception construct, in that both express ideas about causal relationships and the structure of how things are. The third study focuses on individuals' beliefs regarding the ability to reduce environmental threats (one of three types of belief that the theory distinguishes), here, this is in relation to climate change and beliefs about this are seen as "ideas about how true it is that things are related in particular ways" (Schwartz, 2012, p. 16).

By noticing these points of connection, this thesis extends ways of thinking about individuals' understandings by linking two theoretically different strands of research. This shows how beliefs can be influenced from two points; a set of understanding the world (how things are set) and value orientations (how things should be set). Although, as said, the individual's behaviour and the knowledge that causes this behaviour is not the focus of framework theory in conceptual change. The link between the theoretical frameworks can be further understood through two of Stern's (2000) four central factors and causal variables that influence individual's environmental behaviour; individual's values, beliefs and norms and personal capabilities such as the individual's knowledge.

6.5 Implications for practice and policy

In this thesis, it is suggested that business and economics education can and should be seen as environmental education (Stevenson et al., 2013) since understanding pricing and externalities embrace normative and value-laden aspects, interdisciplinary relations, i.e. between individuals, societies and the environment at a global and local level, and a future-oriented perspective. This thesis breaks new ground by examining conceptions of price in the context of the environmental impacts of production and consumption, and by providing findings of how students' conceptions change over time when thinking about environmental and economic topics (Lundholm & Davies, 2013).

Ausubel et al. (1978) stated that learners' knowledge is important to map out at the beginning of a learning sequence. Specifically, they highlighted that the most important single factor influencing learning is what the learner already knows and that this ought to be investigated and guide the teaching. There is still a vital interest in contemporary teaching and learning literature of highlighting the importance of a learner's 'already known' understandings (Hattie & Yates, 2014, p. 146). Following this, the findings can hopefully assist teachers in planning strategies to help students overcome conceptual difficulties in that results show domain specific conceptions and learning. More specifically,

the evidence of change in students' conceptions can help teachers to plan for change within lessons and through longer programmes of study (Bransford, Darling-Hammond, & LePage, 2005). In this regard, the project adds insights that enable teachers to develop their pedagogical content knowledge (PCK) in the fields of business/economics and environmental education at the upper secondary school level. As the thesis shows, the distinction between basic, partial and complex conceptions could support teachers' awareness and readiness to guide students moving from one conception to another on environmental issues and pricing.

Furthermore, as the results show, while students are consumers and have that experience, teaching cannot solely use daily experiences for developing an understanding of price. The understanding of price develops along separate pathways, and there is no automatic spill over from a development in one pathway to a development on the other. One implication is that teaching should explicitly help students to develop a coherent way of thinking about 'how things are' as well 'how things should be'. Economic analysis of policy responses to environmental problems emphasises the importance of market incentives (and the implications of their absence), therefore, a development of students' understanding of the relationships between consumer preference and environmental problems is important for citizenship.

Moreover, curriculum design often discourages integration between the natural sciences and social sciences - especially economics perspectives on environmental issues. Previous research on environmental education has largely reported conceptions of climate change that are restricted to the domains of the natural sciences. Concerning economics education, this thesis suggests that practitioners should be encouraged to reflect on its potential for explicitly underlining and highlighting to students the pricing of goods and services. Also, as mentioned, questions that concern how the future should be formed, or questions that concern how *things should be* rather than how *things are* can be addressed in educational settings. Torbjörnsson and Molin (2015) showed that future-oriented perspectives within education seemed to be an uncommon angle and unexpected by upper secondary school students. Based on the findings it is suggested that teachers together with students problematize and highlight the relationship between individuals' economic and environmental conceptions, experiences and values, through questions addressing 'what should be the case?' and elaborate on various added information in relation to this.

Finally, students may be encouraged to consider environmental issues in lessons of 'science', 'geography' or 'business and economics', and this raises questions of how the curriculum supports students in making sense of how these perspectives are related, and integrated. More specifically, issues that lie at the intersection of subject domains are at risk of neglect, duplication or

fragmentation. They demand particularly close attention from curriculum designers, writers of examination questions and curriculum co-ordinators in schools.

6.6 Future research

The thesis is written within a research area, which relates various theoretical frameworks, subject specifics as well as methods. These have generated various foci of interests for future research and in this final section I will consider some of these. The first focus concerns the findings in Article I and II. Here students suggest that environmental impact generate costs and should render higher prices, which suggest that negative externalities should be paid for. This could be further explored in relation to students' system understanding of society's various economic actors. More specifically future research on business and economics students' could focus on their understanding about how taxes, legislations and other measurements influence markets and resource management at a global or wider geographical scale. Regarding the results in Article II, further research on students' understandings of environmental and economic systems interactions would be interesting to explore in relation to students' epistemological beliefs. Although longitudinal studies are time consuming it is important to design longitudinal studies on interdisciplinary content matters. One approach to this could be to a longer timespan than one year, and to invite students to comment on their process of thinking to show additional understanding of learning and capture their epistemic beliefs (of science, economics as science and meta cognition) in relation to conceptual change.

The largest average increase in value importance was found for the biospheric value orientation. This was measured for example by importance in respecting the earth, unity with nature and protecting the environment. Interestingly one could also assume that biospheric values are shown in students' responses to the interview question of how prices *should* be set. If, as VBN theory proposes, values frame beliefs which in its turn frame norms for environmental behaviour it could be reasonable to interpret a biospheric value orientation from the stand of a norm and belief expressed through '*prices should be higher for goods that generate negative impact because this would reduce the amount of goods being sold and thereby less negative impact will arise*'. It would therefore be interesting to explore if students with more complex understanding of price and externalities are more in favour of higher prices and taxes. This in turn would investigate possible links between knowledge and behaviour and more specifically if and how knowledge influences behaviour. With reference to Kollmuss and Agyeman, (2002 p. 249) "It might be true that en-

vironmental knowledge and environmental attitude have a more powerful influence on people's indirect actions (e.g. people's actions as citizens) than on people's direct pro-environmental behaviours (e.g. recycling, taking public transportation)".

7. Sammanfattning/ Summary in Swedish

Föreliggande avhandling bygger på tre artiklar som undersöker gymnasieelevers miljöekonomiska föreställningar och värderingar. De två första artiklarna studerar förändringar av elevers föreställningar om varor och tjänsters prisbildning i relation till produkternas negativa miljöpåverkan. Den tredje artikel undersöker samband som förklarar miljövänligt agerande, speciellt hur förändringar av värderingar, föreställningar och normer kring lösningar på klimatförändringar påverkar individens agerande.

De studier som presenteras i artiklarna tar utgångspunkt i en global medvetenhet om klimatförändringar och att konsekvenser av mänskligt orsakade temperaturförändringar kan inkluderas i kostnadskalkyler för framtiden. FN:s Miljöprogram (UNEP, 2011) visar på globala kostnader för miljöpåverkan och att dessa kan ses som sociala kostnader, s.k. negativa externaliteter, och beräknas att uppgå till omkring 18 % av global BNP år 2050. Miljöförstöring förstås här som ett socialt fenomen som skapar kostnader för samhällen och individer, men där sådana kostnader inte fullt ut tas omhand (internaliseras i priset, dvs. betalas för) av de som orsakat dem utan de får bäras av tredje part. Ett exempel är att klimatförändringar minskar tillgång på färskvatten i glaciärnära områden vid avsmältning. De som i första hand drabbas är de som lever i dessa områden, och får därmed ta konsekvensen och kostnaden av andras negativa miljöpåverkan i form av utsläpp av växthusgaser. En kostnad uppstår då de drabbade behöver söka annat vatten eller genom försämrade förutsättningar för odling. Sammanfattningsvis belyser negativa externaliteter kostnader som skapas av marknaden, men som inte fullt ut är den del av marknadspriset.

Tidigare forskning om lärande av ekonomiska fenomen, som till exempel begreppet pris, har inte berört ekonomisk förståelse i ett vidare socialt sammanhang (Lundholm & Davies, 2013; Webley, 2005). En del av forskningen har handlat om hur barn och unga utvecklar förståelse om till exempel begrepp som lön, bank, pris och pengar (Berti & Bombi, 1988). Det har visat sig att erfarenhetsbaserade vardagsföreställningar eller s.k. alternativa föreställningar (alternativa i förhållande till vetenskapligt etablerade föreställningar) (Driver & Easley, 1978), framträder tydligt. Till exempel ses en varas karaktäristika som avgörande för dess pris. Studier på barns föreställningar av t ex. Burris (1983) visade att en bok ses som dyrare än en armbandsklocka på grund

av att boken är större, eller att en klocka kan vara dyrare eftersom man får veta 'vad klockan är' medan en bok 'kan man bara läsa'. Här framhölls därmed att varans betydelse och funktion för individer också påverkar priset. En annan del av tidigare forskning omfattar fenomenografiska studier. Dahlgren och Marton (1978) samt Pang och Marton (2005) har bland annat visat på kvalitativt skilda uppfattningar om prisförståelse. Resultaten har, i tillägg till uppfattningen om att en varas pris bestäms av dess karakteristika, visat att utbud och efterfrågan är aspekter; var för sig eller tillsammans som påverkar prisbildning. Det är mot denna bakgrund och begreppsbildningsteori (Sinatra & Pintrich, 2003; Vosniadou, Vamvakoussi, & Skopleiti, 2008) som avhandlingens två första artiklar tar avstamp för att undersöka hur föreställningar om negativ miljöpåverkan och pris förändras hos elever som studerar ekonomi på gymnasiet.

Ytterligare utgångspunkt för avhandlingen är att elevers miljöekonomiska föreställningar och värderingar har ett visst inflytande över hur ekonomiska och politiska förändringar i samhället tar form. Gymnasieelever står inför att fatta beslut om framtida studie- och yrkesval och de får möjlighet att delta i demokratiska val och därigenom forma ekonomiska och politiska förändringar i samhället. Dessutom börjar man i den åldern bli ekonomiskt delaktig i samhället genom ekonomiska val som konsument med egna medel och genom olika anställningar till exempel i form av helg-, kvälls- och feriearbeten. Därför är det viktigt att, mot bakgrund av pågående klimatförändringar, studera hur unga studenter förändrar sina föreställningar och värderingar angående storskaliga/kollektiva miljölösningar (Mansbridge, 2014).

Forskning om värderingar, som abstrakta idéer om det önskvärda och guidande principer för individers beteende, har visat att förändringar sker långsamt (Rokeach, 1973; Schwartz, 2005). Det finns också resultat som visar att värderingar uttrycks och formas i relation till olika utbildningssammanhang (Chang Rundgren & Rundgren, 2010; Hofmann-Towfigh, 2007; Sheldon, 2005). Avhandlingens tredje artikel studerar förändringar av och samband mellan individers värderingar, föreställningar och normer avseende lösningar på klimatförändringar och hur de påverkar olika ageranden (Stern, 2000).

7.1 Syfte och frågeställningar

Avhandlingen har två övergripande syften. Det första är att identifiera och karakterisera förändringar i ekonomielevs föreställningar om pris och miljöpåverkan för olika varor och tjänster. Det andra syftet är att identifiera och karakterisera förändringar av värderingar, föreställningar och normer rörande effektiva lösningar på klimatproblem.

Följande forskningsfrågor är fokus för avhandlingen,

- i. Hur föreställer sig elever negativ miljöpåverkan och varors priser och vilka föreställningar förändras respektive förändras inte när det handlar om hur pris påverkas och borde påverkas av negativ miljöpåverkan? (artikel I och artikel II)
- ii. Vad förändras i elevers värderingar, föreställningar och normer avseende lösningar på klimatproblem, och hur förändras samband mellan dessa? (artikel III)

7.2 Metod

Avhandlingen bygger på tre olika studier som presenteras i tre artiklar. Data har samlats in under sammanlagt 2,5 år och 322 elever från elva gymnasieskolor deltog. Alla elever hade valt att studera företagsekonomi och närliggande kurser genom att följa nationella ekonomiprogrammet (Lpf 94) eller genom att läsa företagsekonomikurser som tillval.

I den första studien (artikel I) deltog 110 elever i en öppen enkät (se bilaga 1, fråga 1-2). Eleverna gav skriftliga beskrivningar rörande vad de ansåg vara anledningar till prisskillnader mellan olika par av likvärdiga eller samma varor men med olika priser. Alla varor hade valts med tanke på deras negativa miljöpåverkan genom produktion/konsumtionen men ingen miljökoppling presenterade/specificerades i enkäten för eleverna. Ett exempel på varu-par som jämfördes är kranvatten och vatten på flaska, två par jeans och två likadana hamburgare men med olika pris. Alla elever fick också svara på frågan 'vad borde priset vara för en flygresor och en tågresa till samma destination?', det vill säga vad priset för dessa tjänster *borde* vara. Frågan är normativ och har traditionellt sett inte använts i forskning om begreppsbildning.

De studier som presenteras i den andra och tredje artikeln har en longitudinell design. Den andra artikeln presenterar resultat från intervjuer (se bilaga 2) med 16 elever från tre skolor. Samma intervjuer repeterades ett år senare med 15 av eleverna och innan studentavslutning. I intervjuerna, till skillnad från den öppna enkäten, förklarade och resonerade eleverna om pris och miljökopplingar för olika varor och tjänster där ena varan, en hamburgare, tydligt exemplifierades som ekologiskt producerad/miljövänlig och den andra likvärdiga varan var en konventionellt producerad hamburgare. I likhet med första studien fokuserade intervjuerna på brisbilning utifrån två olika perspektiv; hur pris *är* och vad priset *borde* vara. Analyser av elevernas beskrivningar och resonemang har gjorts med hjälp av kvalitativ innehållsanalys (Graneheim och Lundman, 2004) och tematisk analys (Braun och Clark, 2006).

Artikel III presenterar resultat från en kvantitativ studie med enkätfrågor (se bilaga 3, B35-B43; C49-C51, C53-58, C60-C61; D1-D13) och 212 elever i nio skolor deltog. I studien undersöks samband mellan värderingar, föreställningar och normer rörande olika lösningar på klimatförändringar, och samma enkät besvarades av sju av de nio klasserna ett år senare när eleverna gick i årskurs 3 på höstterminen. Data har behandlats i ett statistiskt analysprogram (SPSS 21) genom faktor-, korrelations- och klusteranalys, t-tests (signifikans-test) samt linjär regressionsanalys.

7.3 Resultat

Resultaten (artikel I och II) visar att vissa varor förknippades med miljöpåverkan mer än andra varor i relation till pris. Miljökopplingen beskrevs oftast med kvalitativt skilda resonemang utifrån produktionsaspekter. Till exempel att en vara genererar växthusgasutsläpp eller att tillverkningen skadar miljön vilket kopplades till priset. Sammantaget beskrev eleverna i större grad miljö kopplat till produktionsaspekter än konsumtionsaspekter i sina förklaringar av hur prisbildning sker. Ett viktigt resultat är att när eleverna resonerade om hur de anser att prisbildning *borde* vara så fick konsumentperspektivet och efterfrågan större plats. I artikel I exemplifieras detta i beskrivningar om hur priset *borde* vara för en internationell tåg- respektive flygresa till samma destination. Nära hälften av eleverna beskrev att priset på flygresan *borde* vara dyrare än tåget eftersom flyget tillskrevs mer negativ miljöpåverkan och att konsumenterna därmed sporras till att inte välja flyget. En viktig slutsats här är att när *borde-frågan* besvarades visade eleverna en annan prisförståelse - en konsumentaspekt blev tydlig. I artikel II utvecklades den första studiens design i och med att intervjun specificerade varor med miljöpåverkan. En vara (i paret) beskrevs som i) jämförelsevis mer miljövänlig, ii) *borde-frågan* ställdes två gånger under intervjun, och iii) en text presenterades för eleven som beskrev miljöpåverkan från köttproduktion (negativ påverkan i form minskad biodiversitet och växthusgasutsläpp) innan den sista *borde-frågan* ställdes. Resultaten visar att efter *borde-frågan* och den specifika informationen presenterats resonerade eleverna om hur konsumenterna *borde* internalisera negativa externaliteter. Vidare visar resultaten i artikel II på olika beskrivningar av miljökoppling till pris. De tematiseras som *elementär*, *partiell* och *komplex* föreställning om produktionsaspekter respektive *elementär* och *partiell* föreställning om konsumentaspekter. Föreställningarna skiftar tydligt över tid för nästan alla intervjuade elever och förändringarna inkluderar ofta partiella föreställningar.

I artikel III studeras förändringar av, och samband mellan, värderingar, föreställningar och normer rörande åtgärder från staten och marknaden att minska klimatförändringar. När mätningen utgår från hur studiens faktoranalys presenterat värdeorienteringarna visar resultaten att altruistiska, biosfäriska och egoistiska värdeorienteringar i snitt förstärktes efter ett år och att biosfäriska

värderingar ökade mest i styrka över tid. Sammantaget visar resultatet på små och stabila värderingar som förändras lite vilket är i linje med tidigare forskning. Vidare visar resultaten att skiften mellan svaga och starka värdekluster var mycket vanliga på individnivå. Föreställningarna om olika lösningars nytta för att lösa klimatproblem kan sammanfattas i tre olika områden; marknadspriser, utbildning/information samt skatter och lagar. Alla lösningar avtog i betydelse som effektiva lösningar och medan normerna i snitt inte förändrades över tid var normförändringar på individnivå tydligare. Ett intressant resultat visade att förändrade priser på varor (marknadspriser) tillskrevs som minst effektiv lösning, medan studenterna föreställde sig skatter och lagar som den mest effektiva åtgärden. Statistiskt samband fanns mellan en biosfärisk värdeorientering och vilja att minska den egna konsumtionen och acceptera högre priser på varor. Egoistiska värderingar associerades med stöd för högre priser men mindre benägenhet att se policybaserade handlingar av stat och marknad som betydelse för att lösa klimatproblem. Studiens teoretiska ramar specificerar att individers värderingar, föreställningar och normer formar olika (intentionella) handlingar (Stern, 2000). Resultat visar att studenter med ökade egoistiska värden och ökad tilltro till att skatter är effektiva lösningar var mindre villiga att själva agera för att lösa klimatfrågan. Resultaten visade inga kausala samband mellan värdeförändringar och normförändringar men ett viktigt bidrag är resultat som visar på indirekta samband via föreställningsförändringar (beliefs) och normförändringar.

7.4 Avslutande reflektion

Avhandlingen har visat på gymnasieelevers begynnande föreställningar om negativa externaliteter och hur föreställningar om pris och miljökopplingar formas över tid. Avhandlingen identifierar tre kvalitativt skilda föreställningar om hur miljöpåverkan blir en aspekt av produktionen och två olika föreställningar om hur miljöpåverkan blir en aspekt av konsumenters påverkan och önskemål. Vidare finns en stor variation i hur föreställningar förändras över tid. Avhandlingens studier har undersökt individers värderande föreställningar genom att i både skrift och intervjuer fråga hur priset *borde* vara för olika varor. Resultatet bidrar till tidigare forskning genom att visa att ekonomielever beskriver konsument-relaterade negativa externaliteter när ett värderande sammanhang och miljöspecifik information erbjuds att resonera utifrån. Resultaten visar också att det finns ett samband mellan elevers föreställningar om effektiva lösningar och (normer för) handlingar så som de studeras här. Det understryker ekonomi- och miljöundervisningens potential för att utveckla elevers kunskap som kan påverka handlade för att lösa klimatförändringar orsakade av människan.

Kunskap om ämnesspecifikt innehåll i elevers föreställningar, och hur det formas över tid, är betydelsefull för att förstå elevers ämnesspecifika lärande. Det

är också betydelsefullt för att utveckla undervisning om fenomen som omfattar både värderings- och kunskapsaspekter i relation till t ex. klimatförändringar och prisförståelse. Ausubel, Novak och Hanesian (1978) och Hattie och Yates (2014) har pekat på att elevers förförståelse av ett undervisningsinnehåll är viktigt att ta hänsyn till och angeläget för lärare att beakta för att främja elevers lärande. Vidare kan undervisning ge elever möjlighet att bli medvetna om sina förkunskaper, initiala föreställningar och värderingar genom att dessa synliggörs och problematiseras. Här kan frågor som explicit skiljer på hur det *är* och hur det *borde* vara utgöra utgångspunkt för elevers resonemang, och främja deras kunskapsutveckling rörande ekonomiska, politiska och sociala dimensioner av miljöproblem och deras lösningar.

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Appendices

1a Open ended questionnaire: (Article I)

Name:

Girl Boy

Id-number: (only the first numbers)

School:

Program of Education:

Class:

(Please mark in the circles)

Which course/courses are you participating in?

Civics A Business Economy A Business Economy B

Which course/courses have you finished?

Civics A Business Economy A Business Economy B

Please read the following descriptions and try to describe how you think of the different situations.

1a) You get invited to a friend in London and when you compare prices for tickets you find out that prices differ. How would you explain the price of 308 sek for a return ticket by flight and the price of 2 495 sek for a return ticket by train?

.....
.....

² All questionnaires included the travel ticket-question, while the additional pair of goods presented to students varied between beef burgers, drinking water, cotton socks, personal computers and jeans (which is exemplified here).

.....
.....
1b) Should the airplane ticket be more expensive compared to the train ticket?
Please mark your response. Yes No Do not know

1c) Please describe how you think.

.....
.....
.....
.....

2) You are planning to buy a pair of new jeans and enter a shop you like. When decided on which pair you will buy you find that the price is higher than for any other pair of jeans. Why is it like that?

.....
.....
.....
.....

3) You come to the conclusion that you will wait one or two months for the price to change. Why should the price on the jeans you want to buy be reduced in that time?

.....
.....
.....
.....

4) At the same time there is a period of strongly increased price for oil and coal. Please explain what you may think have happened to the price of the jeans you are going to buy because of the increased price for oil and coal.

.....
.....
.....
.....

Were there any questions that you found unclear? If so, please note which question.



Thank you for participating!

Caroline Ignell
Department of Education, Stockholm University

1b Öppen enkät³ (artikel I)

Namn:.....

Tjej Kille

Personnummer: (enbart de 6 första siffrorna)

Skola:

Program:

Årskurs/Klass:

(Sätt kryss i cirkelarna)

Kurs/kurser du läser nu? Samhällskunskap A Företagsekonomi A
Företagsekonomi B

Kurs/kurser du läst klart? Samhällskunskap A Företagsekonomi A
Företagsekonomi B

Läs följande frågor och försök beskriva hur du tänker om resor och vatten i de olika situationerna.

1a) Du blir inbjuden till en vän i London och upptäcker att det är prisskillnad mellan biljetterna till London. Hur skulle du förklara att en tur och retur biljett, med flyg kostar 308 kronor och en tågbiljett 2 495 kronor?

.....
.....
.....
.....

1b) Borde flygbiljetten kosta mer än tågbiljetten? Ringa in vad du tycker.
Ja Nej Vet ej

1c) Berätta hur du tänker.

.....
.....

³ Alla enkäter innehåll frågan om tåg och flygbiljetter medan övriga varor varierade mellan hamburgare, dricksvatten, bomullssockor, person dator och jeans (som exemplifieras här).

.....
.....
2) Du planerar att köpa ett par nya jeans och går till en butik du gillar. När du bestämt dig för ett par som du vill köpa ser du att priset är högre än för de andra jeansen i affären. Varför är det så?

.....
.....
.....
.....

3) Du beslutar dig för att vänta med inköpet ett par månader för att se om priset förändras. Kommer priset på jeansen sjunka eller stiga under den tiden? Förklara hur du tänker.

.....
.....
.....
.....

4) Under tiden du väntar uppstår en kraftig prisökning på olja och kol. Förklara vad som händer med priset på jeansen du vill köpa i och med prisökningen på olja och kol.

.....
.....
.....
.....

Var det någon fråga som var oklart formulerad?

Vilken i så fall?



Tack för att du besvarat frågorna!

Caroline Ignell
Pedagogiska institutionen, Stockholms universitet

2a Interview guide (Article II)

Introduction about voluntary participation, anonymity and possible to stop at any time.

1. Do you sometimes buy a beef burger? If so, how often?
2. Are there differences in price between burgers that are more environmentally friendly and those that are not?
Describe, what are the prices?
3. Does this surprise you?
4. Why is it like this?
5. What influences these prices?
6. Are there other factors that influence price? (This question was repeated several times during the session to assure the students that they got the opportunity to present all possible causes to prices he/she could think of.)
7. What should the prices for the beef-burgers be? If you could decide.
8. Is there anything additional that should influence the price?
The interviewer presented information specifics of negative impact related to beef-burgers on a laptop and after this the seventh question was repeated somewhat modified.
9. Is this something that should influence the prices for the beef-burgers, when you have seen this information?

2b Intervjuguide (artikel II)

Introduktion om att deltagandet är frivilligt, att man är anonym och att man kan avbryta när man vill.

1. Brukar du köpa hamburgare? Hur ofta?
 2. Är det någon skillnad i pris mellan en miljövänligare hamburgare och en icke miljövänlig hamburgare? Beskriv vad är det?
 3. Är du förvånad över att det är så?
 4. Varför är det så?
 5. Vad är det som gör att priserna är så?
 6. Finns det andra saker som påverkar priset? Repetera frågan.
 7. Hur borde priset vara för de olika hamburgarna om du fick bestämma?
 8. Finns det andra faktorer som borde påverka priset?
- Visa texten på datorn om olika miljöpåverkan och fråga igen,
9. Hur borde priset vara? Är det här något som borde påverka priset?

3a Questionnaire (Article III)

3b Enkät (artikel III)

Hello!

Thank you for responding to questions about some environmental problems, their causes and solutions. One part of the survey focuses on which general values that are important to you and how you look upon science. Maybe you participated in this survey last year and now it is time for a follow-up. The survey is a project that I carry out within the Ph.D. education at the University of Stockholm and its Department of Education.

The answers will only be read by me and my supervisors Cecilia Lundholm and Peter Davies, and the material will be treated with confidentiality. The responses will be de-coded, which means that it will not be possible to link specific responses to a certain name in the summary of the result. It is voluntary to participate and you may stop anytime you like.

Please write your name and e-mail address so that it is possible to view how the answers may change over time. Thanks in advance for your contribution to this research!

Caroline Ignell, 08-161573

Caroline.ignell@edu.su.se

Name _____ Surname _____

E-mail _____

School _____ Class _____

Part A) This part presents some general questions concerning your education and everyday life.

1. Female Male
2. When are you born? 1993 1994 1995 Another year: _____
3. I have finished Business A 3.1 I have finished/participate now in Business B
4. I have finished Civics A 4.2 I have finished/participate now in Civics B
5. I have finished Geography A 5.2 I have finished/participate now in Geography B
6. I have finished Science A 6.2 I have finished/participate now in Science B
- If you participated in the questionnaire last year you do not need to respond to A7-A12, start again on A13.**
7. This educational program was my first choice. yes no
8. I chose this program because... (Choose one reason)
- 8.1 I am interested in Economics and Business
- 8.2 My friends chose this program
- 8.3 My parents wanted me chose this program
- 8.4 I wanted to prepare for economy studies at university
- 8.5 The school is close to my home
- 8.6 Another reason
9. One or both my parents have studied at universities yes no
10. One or both my parents run a business. yes no
11. I go abroad for holiday never less than once a year once a year several times a year
12. Where I live most of the times we have no car one car two or more cars

In the following part the questions concern hobbies and extra job.

13. I am a member of a political organisation environmental organisation sport organisation another
- | | never | seldom | sometimes | often |
|--|--------------------------------|---------------------------------------|--------------------------|--------------------------|
| 14. I discuss Economics and money with parents | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. I discuss Economics and money with friends | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. I discuss Economics and money in lessons | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. I discuss environmental issues with parents | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. I discuss environmental issues with friends | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. I discuss environmental issues in lessons | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. I take part of news from Internet, TV, radio or papers | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21. I take care of the whole student allowance | agree <input type="checkbox"/> | do not agree <input type="checkbox"/> | | |
| 22. I buy most of my clothes | agree <input type="checkbox"/> | do not agree <input type="checkbox"/> | | |
| 23. I have an extra job in evenings, weekends or holidays | agree <input type="checkbox"/> | do not agree <input type="checkbox"/> | | |

Part B) In this part you meet assumptions on two particular environmental issues: eutrophication in the Baltic Sea and increased greenhouse effect. To what extent do you ascribe the following assumptions to generate the environmental issues and to what extent do you ascribe them to be solutions? **Mark with one X, per assumption, the level of influence you agree with, and try not to use *Don't know*.**

B1. Various nourishment like Nitrogen and Phosphorus reach the Baltic Sea and contribute to eutrophication of the Sea and this leads to lack of Oxygen. By this fish and animal plankton have difficulties to survive.

B1.1 Do you agree that emissions of Nitrogen and Phosphorus lead to eutrophication of the Baltic Sea? Yes No

In the following section; assume that eutrophication is generated by humans' activities, to what extent do you ascribe following assumptions to generate eutrophication in the Baltic Sea?

	Not at all	To a minor extent	Fairly much	A lot	Don't know
1. Nourishment leak from farming.	<input type="checkbox"/>				
2. Boats and ships empty their drainage.	<input type="checkbox"/>				
3. Consumers lack knowledge about eutrophication.	<input type="checkbox"/>				
4. Cars and Lorries let out fertilizer.	<input type="checkbox"/>				
5. The forestry leak fertilizers into the Baltic Sea.	<input type="checkbox"/>				
6. Producers do not pay for the eutrophication caused by their production.	<input type="checkbox"/>				
7. Producers lack of knowledge of eutrophication.	<input type="checkbox"/>				
8. Producers are not interested in issues with eutrophication.	<input type="checkbox"/>				

	Not at all	To a minor extent	Fairly much	A lot	Don't know
9. Consumers do not pay for the eutrophication caused by the goods they buy.	<input type="checkbox"/>				
10. Industries contaminate the water.	<input type="checkbox"/>				
11. Consumers are not interested in issues with eutrophication.	<input type="checkbox"/>				
12. The price on fertilizers influences eutrophication.	<input type="checkbox"/>				
13. Laws protecting the Sea vary in many countries around the Sea.	<input type="checkbox"/>				
14. Global businesses have an impact to society around the Sea.	<input type="checkbox"/>				

In the following part the assumptions focuses solutions to the problem with eutrophication. To what extent do the following descriptions help to solve the problem?

	Not at all	To a minor extent	Fairly much	A lot	Don't know
15. Organizations like KRAV or WWF inform on eutrophication.	<input type="checkbox"/>				
16. Consumers get education about eutrophication.	<input type="checkbox"/>				
17. Consumers buy less goods causing eutrophication.	<input type="checkbox"/>				
18. The amount of goods in the market reduces.	<input type="checkbox"/>				
19. Producers get subsidies to become more environmental friendly.	<input type="checkbox"/>				
20. Prices for goods causing eutrophication increases.	<input type="checkbox"/>				

- | | Not at all | To a minor extent | Fairly much | A lot | Don't know |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 21. Media highlights impact generated by eutrophication. | <input type="checkbox"/> |
| 22. Increased tax on fertilizers. | <input type="checkbox"/> |
| 23. Laws are initiated in countries around the Sea for protecting the water. | <input type="checkbox"/> |

B2. Carbon emission and other greenhouse gases (GHG) are let out in the atmosphere and this leads to a rising temperature around the world. An example, a beef burger's life cycle, from the farmer to the plate, contributes to about 1 1/2 kg of greenhouse gases that are let out in the atmosphere.

B2.1 Do you agree on that emissions of greenhouse gases cause climate change? Yes No

In the following part, assume that emissions of greenhouse gases are caused by man's activities, to what extent are those descriptions causing the problem?

- | | Not at all | No a minor extent | Fairly much | A lot | Don't know |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 24. Farms let out greenhouse gases by cultivating the soil and raising cattle. | <input type="checkbox"/> |
| 25. Consumers are not interested in problems with greenhouse gas emissions. | <input type="checkbox"/> |
| 26. Producers of beef burgers do not pay for the negative environmental impact caused by the production. | <input type="checkbox"/> |
| 27. Producers lack knowledge of greenhouse gas emissions. | <input type="checkbox"/> |
| 28. Producers are not interested in issues with greenhouse gas emissions. | <input type="checkbox"/> |
| 29. Consumers of beef burgers do not pay a cost for generating negative impact. | <input type="checkbox"/> |

	Not at all	To a minor extent	Fairly much	A lot	Don't know
30. Consumers lack knowledge of greenhouse gas emissions.	<input type="checkbox"/>				
31. Cars and Lorries let out greenhouse gas emissions.	<input type="checkbox"/>				
32. The Petrol price influence to the emissions.	<input type="checkbox"/>				
33. It is a lack of laws reducing greenhouse gas emissions around the world.	<input type="checkbox"/>				
34. Global businesses have an impact to society.	<input type="checkbox"/>				

In the following part the assumptions focuses solutions to the problem with increased greenhouse gases. To what extent do the following descriptions help to solve the problem?

	Not at all	To a minor extent	Fairly much	A lot	Don't know
35. Organizations like KRAV and WWF inform on climate change.	<input type="checkbox"/>				
36. Consumers get education in greenhouse gases.	<input type="checkbox"/>				
37. Consumers buy less beef burgers.	<input type="checkbox"/>				
38. The amount of beef burgers in the market reduces.	<input type="checkbox"/>				
39. Producers get subsidies to become more environmental friendly.	<input type="checkbox"/>				
40. Prices for beef burgers increases.	<input type="checkbox"/>				
41. Media highlight impact generated by greenhouse gases.	<input type="checkbox"/>				
42. Increased tax on greenhouse gases emissions.	<input type="checkbox"/>				
43. Laws are initiated for allowable greenhouse gas emissions.	<input type="checkbox"/>				

Part C) Some statements will be presented in the following part and you are asked to mark X in a box to the level you agree with the statements.

	Totally disagree	Partly disagree	Partly agree	Fully agree
44. The nature is important to the economy in the society.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Economic growth, GDP, is a basis for solving environmental issues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Economic growth, GDP, leads to environmental issues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. I have no individual power influence companies and politicians' decisions on natural resources.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. I have no individual power to influence companies' and politicians' decisions on natural resources.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. I am willing to pay a cost for negative environmental impact goods buy generate and thereby pay a higher price.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. I am willing to support political proposals on increased co2 tax for car petrol.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. I am willing to support political proposals on increased co2 tax for flight gas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. I am willing to pay more for food produced in an ecological way.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. I am willing to pay 20 SEK extra for a beef burger to compensate for the GHG emissions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. I am willing to give up holiday flights to reduce GHG emissions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. I am willing to give up holiday trips by car to reduce GHG emissions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. Food prices should be higher if the products generate GHG emissions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Totally disagree	Partly disagree	Partly agree	Fully agree
57. Prices on clothes should be higher if they generate GHG emissions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. Prices on travel tickets should be higher if they generate GHG emission.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. Technical development is a condition for solving environmental issues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60. It is the government that should solve environmental issues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61. It is the private companies that should solve environmental issues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part D) In this part various values are described and in the parentheses is an explanation that may help you to understand its meaning. **Please indicate** how important each value is for you by putting a circle around the number.

Use the rating scale below:

- 0 the value is not at all important to you.
- 3 the value is important.
- 6 the value is very important.
- 1 the value is opposed to the principles that guide you.
- 7 is for rating a value of supreme importance in your life and **you can chose at maximum two such values(7)**.

The higher the number, the more important the value is to you. Try to distinguish as much as possible between the values by using different numbers.

	<i>Opposed to my values</i>	<i>Not important</i>	<i>Important</i>	<i>Very important</i>	<i>Of supreme importance</i>				
1. Equality (equal opportunity for all)	-1	0	1	2	3	4	5	6	7
2. Respecting the earth (harmony with other species)	-1	0	1	2	3	4	5	6	7
3. Social power (control over others, dominance)	-1	0	1	2	3	4	5	6	7
4. Unity with nature (fitting into nature)	-1	0	1	2	3	4	5	6	7
5. A world at peace (free of war and conflict)	-1	0	1	2	3	4	5	6	7
6. Wealth (material possessions, money)	-1	0	1	2	3	4	5	6	7
7. Authority (the right to lead or command)	-1	0	1	2	3	4	5	6	7
8. Social justice (correcting injustice, care for the weak)	-1	0	1	2	3	4	5	6	7
9. Protecting the environment (preserving nature)	-1	0	1	2	3	4	5	6	7
10. Influential (having an impact on people and events)	-1	0	1	2	3	4	5	6	7
11. Helpful (working for the welfare of others)	-1	0	1	2	3	4	5	6	7

12. Preventing pollution (protection of natural resources)	-1	0	1	2	3	4	5	6	7
13. Ambitious (hard-working, aspiring)	-1	0	1	2	3	4	5	6	7

Part E) In this part you will find various statements on beliefs of scientific knowledge and the nature of scientific theories and knowledge. Please put one X in the following boxes, one mark for each statement.

Please mark with X to what extent you agree to the following statements.	I totally agree	I mainly agree	I mainly disagree	I totally disagree
1. Scientific theories can be proven at any time.				
2. Scientific theories that we presently consider to be correct can be proven false in the future.				
3. Even scientific knowledge must be revised time and again.				
4. At some stage, scientists will be able to explain the whole world.				
5. Scientific research shows that for most problems there is one clear-cut answer.				
6. Scientific laws are universal truths.				
7. Scientific knowledge is unimpeachable.				

This is the first time I participate in the Questionnaire. Yes No I participated in an interview in spring 2012. Yes No

Thank you for participating! If you have any comments to the questions please feel free to add them here.

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Hej!

HT 2012

Tack för att du vill vara med och svara på frågor om några miljöproblem, deras orsaker och lösningar. En del av enkäten handlar också om vilka övergripande värderingar som är viktiga för dig och hur du ser på vetenskap. Förra året besvarade du kanske den här enkäten och nu är det dags för en uppföljning. Undersökningen är ett projekt som jag gör inom forskarutbildningen på Stockholms universitet och Institutionen för pedagogik och didaktik.

Svaren kommer bara att läsas av mig och mina handledare, Cecilia Lundholm och Peter Davies och materialet kommer behandlas konfidentiellt. Enkätsvaren kommer att bli avidentifierade vilket betyder att det inte går att koppla enskilda svar till ett visst namn i sammanställningen av resultatet. Det är frivilligt att delta och du kan avbryta deltagandet när du vill.

Du skriver ditt namn och e-postadress här nedan för att göra det möjligt att se hur svaren ändrats över tid. Tack på förhand för att du bidrar till forskningsprojektet!

Caroline Ignell, 08-16 15 73
Caroline.ignell@edu.su.se

Förnamn _____ Efternamn _____

Mejladress _____ (texta tydligt)

Skola _____ Klass _____

Del A) Den första delen tar upp allmänna frågor.

1. Tjej Kille
2. När är du född? 1993 1994 1995 Om något annat år, vilket: _____
3. Jag har läst Företagsekonomi A 3.1 Jag har läst/läser Företagsekonomi B
4. Jag har läst Samhällskunskap A 4.1 Jag har läst/läser Samhällskunskap B
5. Jag har läst Geografi A 5.1 Jag har läst/läser Geografi B
6. Jag har läst Naturkunskap A 6.1 Jag har läst/läser Naturkunskap B

Om du deltog i enkäten förra året behöver du inte svara på frågorna F7- F 12 utan går till nästa sida och börjar på F13.

7. Jag går det program som var mitt förstahandsval till gymnasiet. ja nej
8. Jag valde programmet för att ... (välj en anledning)
- 8.1 ... jag är intresserad av Ekonomi och Företagsekonomi
- 8.2 ... mina vänner valde programmet
- 8.3 ... mina föräldrar tyckte jag skulle gå programmet
- 8.4 ... jag ville förbereda mig för att läsa ekonomi på universitetet
- 8.5 ... det är nära till skolan från min bostad
- 8.6 Annan orsak
9. Någon av mina föräldrar har läst på högskola/universitet. ja nej
10. Någon av mina föräldrar har ett eget företag. ja nej
11. Jag åker utomlands på semester. aldrig färre än en gång per år en gång per år flera gånger per år

12. Där jag bor mest av tiden har vi... ingen bil en bil två eller fler bilar

Här fortsätter frågorna men handlar nu bland annat om fritidsaktiviteter och extrajobb.

13. Jag är medlem mig i en ... (du kan välja flera) politisk förening idrottsförening annan
aldrig ibland ofta
miljöorganisation sällan

14. Jag pratar med föräldrarna om ekonomi och pengar

15. Jag pratar med kompisarna om ekonomi och pengar

16. Jag pratar på lektionerna om ekonomi och pengar

17. Jag pratar med föräldrarna om miljöfrågor

18. Jag pratar med kompisarna om miljöfrågor

19. Jag pratar på lektionerna om miljöfrågor

20. Jag tar del av nyheter via nätet, tv, radio eller tidningar

21. Jag tar själv hand om hela studiebidraget stämmer ej

22. Jag betalar oftast mina kläder själv stämmer ej

23. Jag har extrajobb på kvällen, helger eller sommaren stämmer ej

Del B) Denma del handlar om två specifika miljöproblem, övergödning i Östersjön och förstärkt växthuseffekt. Fundera över hur mycket du tror de olika faktorerna orsakar problemen. Sätt ett X i den ruta som stämmer med det du tror. **Endast ett X per rad och försök att använda Vet ej så lite som möjligt.**

B1. Olika näringsämnen som kväve och fosfor kommer ut i Östersjön och bidrar till övergödning av vattnet. Det leder till syrebrist vilket gör att fisk och djurplankton får svårt att överleva.

B1.1 Håller du med om att utsläpp av fosfor och kväve leder till övergödning av Östersjön? Ja Nej

Utgå från att övergödningen skapas av människans aktiviteter, hur mycket orsakar följande beskrivningar övergödning i Östersjön?

	Påverkar inte alls	Påverkar lite	Påverkar ganska mycket	Påverkar mycket	Vet inte
1. Näringsämnen läcker från jordbruksmarker.	<input type="checkbox"/>				
2. Båtar i Östersjön släpper ut sitt avlopp direkt i vattnet.	<input type="checkbox"/>				
3. Konsumenter saknar kunskap om övergödning.	<input type="checkbox"/>				
4. Motorer i lastbilar och bilar släpper ut ämnen som kväve och fosfor.	<input type="checkbox"/>				
5. Näringsämnen läcker från skogsbruksmarker.	<input type="checkbox"/>				
6. Producenter betalar inte en kostnad för övergödning deras varorna bidrar till.	<input type="checkbox"/>				
7. Producenter saknar kunskap om övergödning.	<input type="checkbox"/>				
8. Producenter är ointresserade av problemet med övergödning.	<input type="checkbox"/>				

	Påverkar inte alls	Påverkar lite	Påverkar ganska mycket	Påverkar mycket	Vet inte
9. Konsumenter betalar inte en kostnad för övergödningen som varorna bidrar till.	<input type="checkbox"/>				
10. Industrier renar inte sina vattenutsläpp tillräckligt.	<input type="checkbox"/>				
11. Konsumenter är ointresserade av problemet med övergödning.	<input type="checkbox"/>				
12. Priset på gödningsmedel.	<input type="checkbox"/>				
13. Lagar om utsläpp i vattnet ser olika ut i olika länder runt vattnet.	<input type="checkbox"/>				
14. Internationella företag påverkar länderna runt vattnet.	<input type="checkbox"/>				

Nästa del handlar om åtgärder för att lösa problem med övergödning. Hur mycket är följande åtgärder lösningen på problemet tycker du?

	Påverkar inte alls	Påverkar lite	Påverkar ganska mycket	Påverkar mycket	Vet inte
15. Organisationer som KRAV eller Världsnaturfonden (WWF) informerar om övergödning.	<input type="checkbox"/>				
16. Konsumenter utbildas om övergödning.	<input type="checkbox"/>				
17. Konsumenter köper färre varor som orsakar utsläppen.	<input type="checkbox"/>				

	Påverkar inte alls	Påverkar lite	Påverkar ganska mycket	Påverkar mycket	Vet inte
18. Antal varor till salu minskar.	<input type="checkbox"/>				
19. Tillverkare och odlare får bidrag från staten för att tillverka och odla miljövänligare varor.	<input type="checkbox"/>				
20. Priset höjs på varor som bidrar till övergödning.	<input type="checkbox"/>				
21. Nyheter om övergödningen tas upp i medier.	<input type="checkbox"/>				
22. Höjd miljöskatt på gödningsämnen införs.	<input type="checkbox"/>				
23. Nya lagar införs i länderna rund vattnet för skydda Östersjön.	<input type="checkbox"/>				

B2. Koldioxid och andra växthusgaser släpps ut fritt i atmosfären och leder till temperaturhöjning på jorden och förändringar i klimatet på olika platser runt om i världen. I följande påståenden används en hamburgare som exempel på produkt som bidrar till utsläpp av växthusgaser och ungefär ett 1 ½ kg växthusgaser frigörs i atmosfären för att den skall tillverkas.

B 2.1 Håller du med om att utsläpp av växthusgaser leder till höjd temperatur runt om i världen? Ja Nej

Utgå från att växthusgaser frigörs av människans aktiviteter, hur mycket orsakar följande beskrivningar utsläpp av växthusgaser?

	Påverkar inte alls	Påverkar lite	Påverkar ganska mycket	Påverkar mycket	Vet inte
24. Lantbruk släpper ut växthusgaser när de odlar och föder upp köttdjur.	<input type="checkbox"/>				
25. Konsumenter är ointresserade av problemet med utsläpp av växthusgaser.	<input type="checkbox"/>				
26. Producenter av hamburgaren betalar inte en kostnad för miljöeffekter hamburgaren bidrar till.	<input type="checkbox"/>				
27. Producenter saknar kunskap om utsläpp av växthusgaser.	<input type="checkbox"/>				
28. Producenter är ointresserade av problemet med växthusgaser.	<input type="checkbox"/>				
29. Konsumenten betalar inte för miljöpåverkan hamburgaren bidrar till.	<input type="checkbox"/>				
30. Konsumenter saknar kunskap om utsläpp av växthusgaser.	<input type="checkbox"/>				
31. Utsläpp av växthusgaser från transporter med lastbilar och bilar.	<input type="checkbox"/>				
32. Priset på bensin.	<input type="checkbox"/>				

33. Lagar som minskar utsläpp av växthusgaser saknas i många länder runt om i världen.
34. Internationella företags inflytande i samhället.

Nästa del handlar om åtgärder för att lösa problem med utsläpp av växthusgaser. Hur mycket är följande åtgärder lösningen på problemet tycker du?

- | | Påverkar inte alls | Påverkar lite | Påverkar ganska mycket | Påverkar mycket | Vet inte |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 35. Organisationer som KRAV eller Världsnaturfonden (WWF) informerar om klimatförändringar. | <input type="checkbox"/> |
| 36. Konsumenter utbildads om växthusgaser. | <input type="checkbox"/> |
| 37. Konsumenter köper hamburgare mer sällan. | <input type="checkbox"/> |
| 38. Antal hamburgare till salu minskar. | <input type="checkbox"/> |
| 39. Tillverkare och odlare får bidrag från staten för att tillverka och odla miljövänligare varor. | <input type="checkbox"/> |
| 40. Priset på hamburgare höjs. | <input type="checkbox"/> |
| 41. Nyheter om miljökonsekvenser från ökad växthuseffekt tas upp i media. | <input type="checkbox"/> |
| 42. Höjd miljöskatt på utsläpp av växthusgaser. | <input type="checkbox"/> |
| 43. Lagar införs om hur mycket växthusgaser som får släppas ut. | <input type="checkbox"/> |

Del C) Nu kommer några påståenden som du tar ställning till genom att markera med X i *en ruta* det som du tycker stämmer. Hur tänker du om följande påståenden?

	Håller absolut inte med	Håller inte med	Håller med	Håller absolut med
44. Naturen är viktig för samhällets ekonomi.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Ekonomisk tillväxt, det som brukar mätas i BNP, är en förutsättning för att åtgärda miljöproblemen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Ekonomisk tillväxt, BNP, leder till miljöproblem.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Min individuella insats för miljön förbättrar miljön.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Jag är maktlös när det gäller att påverka företag, industrier och politiker som bestämmer över naturresurserna.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Jag kan tänka mig att betala en kostnad för miljöpåverkan genom att betala ett högre pris för varan.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. Jag kan tänka mig att stödja politiska förslag om höjd koldioxidskatt för bensin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Jag kan tänka mig att stödja politiska förslag om höjd koldioxidskatt för flygbränsle.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. Jag kan tänka mig betala mer för matvaror som är odlade med miljövänligare metoder.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Jag kan tänka mig att betala 20 kronor mer för en hamburgare för att kompensera utsläpp av växthusgaser.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Håller absolut inte med	Håller inte med	Håller med	Håller absolut med
54. Jag kan tänka mig avstå från semesterflygresor för att minska utsläpp av växthusgas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. Jag kan tänka mig avstå från bilsemesterresor för att minska utsläpp av växthusgas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. Priset på mat borde vara högre om maten bidrar till klimatförändring.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57. Priset på kläder borde vara högre om kläderna bidrar till klimatförändring.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. Priset på resor borde vara högre om resorna bidrar till klimatförändring.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. Teknisk utveckling är en förutsättning för att lösa miljöproblemen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60. Staten bör lösa miljöproblemen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61. Privata företagen bör lösa miljöproblemen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Del D)

I den här delen beskrivs olika värderingar och inom parentesen förtydligas betydelsen. **Ringa in siffran** om hur viktig varje värdering är för dig. Utgå från: 0 värderingen är inte alls viktigt för dig.

3 värderingen är viktig.

6 värderingen är mycket viktig.

-1 värderingen är tvärsen mot din grundläggande värdering.

7 värderingen är viktigast av alla dina värderingar och **du kan välja max två sådana värderingar** (7:or) i hela delen.

Ju högre siffra ju viktigare är värderingen för dig. Försök att variera så mycket som möjligt genom att markera olika siffror.

	<i>Tvärt emot mina värderingar</i>	<i>Inte viktigt</i>	<i>Viktigt</i>	<i>Mycket viktigt</i>	<i>Vikt- igast</i>				
1. Jämlikhet (samma möjligheter för alla)	-1	0	1	2	3	4	5	6	7
2. Respekt för naturen (harmonier med andra arter)	-1	0	1	2	3	4	5	6	7
3. Socialt inflytande, makt (kontroll över andra)	-1	0	1	2	3	4	5	6	7
4. Ett med naturen (passa in i naturen)	-1	0	1	2	3	4	5	6	7
5. En värld i fred (utan krig och konflikt)	-1	0	1	2	3	4	5	6	7
6. Västånd (materiella ägodelar, pengar)	-1	0	1	2	3	4	5	6	7
7. Auktoritet (rätt att leda andra, besluta över andra)	-1	0	1	2	3	4	5	6	7
8. Social rättvisa (åtgärda orättvisor, omsorg, ta hand om svaga)	-1	0	1	2	3	4	5	6	7
9. Skydda naturen (bevara naturen)	-1	0	1	2	3	4	5	6	7
10. Inflytande (påverka andra människor och händelser)	-1	0	1	2	3	4	5	6	7
11. Hjälpssamhet (bidra till andras väl)	-1	0	1	2	3	4	5	6	7
12. Hindra föroreningar (skydda naturresurser)	-1	0	1	2	3	4	5	6	7
13. Ambitiös (målmedveten, hårt arbetande)	-1	0	1	2	3	4	5	6	7

Del E)

I den här delen handlar påståendena om hur man ser på vetenskap och kunskap och du markerar ditt svar genom att sätta ett kryss i rutan som stämmer med hur du tycker.

Markerar ditt svar genom att sätta X i rutan som stämmer överens med hur du tycker.	Jag håller absolut med	Jag håller delvis med	Jag håller delvis inte med	Jag håller absolut inte med
1. Vetenskapliga teorier kan bevisas när som helst.				
2. Vetenskapliga teorier som vi tänker är korrekta idag kan bevisas som falska i framtiden.				
3. Också vetenskaplig kunskap måste förändras då och då.				
4. Vid något tillfälle kommer forskare kunna förklara allt i världen.				
5. Forskning visar att för de flesta problem finns ett entydigt och klart svar.				
6. Vetenskapliga lagar är allmänna sanningar.				
7. Vetenskaplig kunskap kan inte ifrågasättas.				

Det är första gången jag svarar på enkäten. Ja Nej Jag blev intervjuad våren 2012. Ja Nej

Stort tack för din medverkan! Skriv gärna några rader om vad du tänkt när du fyllt i enkäten.

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