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EDUCATION FOR SUSTAINABLE DEVELOPMENT AND THE NEED FOR EDUCATION IN ETHICS

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Key concepts for sustainability education

- Education for sustainable development should result in professionals and citizens who are motivated to act according to the values of sustainable development and who can contribute to the change of prevailing norms to assist development towards sustainability.
- Ethics in education can to some extent support the social dimensions of sustainable development.
- Students should *know* about values, norms, normative theories, and tools and be able to see when these are applicable in their daily life and then be able to *apply* them correctly.
- An important part of the learning in ethics education is that students should get insights in their *own* norms and values, while in education for sustainable development, it is important that students get insights into the norms and values of *society*.

Introduction

The aim for education for sustainable development is to educate students to become professionals and citizens who have insights and are motivated to act according to these values and who can contribute to the change of prevailing norms for a development towards sustainability. Thus, education for sustainable development requires competencies in ethics, both for students and teachers. Sustainable development is a societal goal based on certain values such as the "Brundtland definition", which says that "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987). Insights and competencies in ethics are necessary not just for the long-term goals for sustainable development but for all kinds of interactions with people and society also in the short-term. For example, a code of conducts for engineers includes norms on how to behave in their interaction with colleagues, customers, public, etc. Therefore, it can be argued that ethics is a subject that should be included in all education.

At Chalmers University of Technology in Sweden, a policy to integrate environmental aspects in all engineering and architecture educations goes back to the 1980s. This

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policy was later broadened to sustainable development and changed to a requirement for content corresponding to a full-time five-week-long course (Holmberg et al. 2012). More recently, there was a requirement to also include ethics across all disciplinary education, which can support the development of social goals in sustainable development. The strategy at Chalmers was from the start to not have a separate education focusing of environment and sustainable development, but to integrate it within all education (Lundqvist 2016). Architects and engineers in all domains should have competencies in sustainable development since all domains can have an impact on and contribute to sustainable development.

The integration of sustainable development and later also ethics across all educations at Chalmers University of Technology has resulted in extensive experience and insights and has provided many good examples of how this can be done (Holmberg et al. 2012; Lundqvist 2016). The purpose of this chapter is to share these experience and insights and to describe and reflect upon how ethics and sustainable development can be integrated in education programs in an effective way.

In educations that will result in a professional degree, such as engineering, architecture, economics, medicine, etc., it is preferable that ethics and sustainable development are integrated as discipline specific ethics education (Harris et al. 1997; Herkert 2002). Ethics and sustainable development should be taught in context and should include content that is relevant for the profession and can enhance motivation and support deep learning (Hanning et al. 2012).

Even though domain-specific integration of ethics and sustainable development is preferable, its development can be challenging. Teachers who have their main competence in the discipline of the program should preferably do the teaching in ethics and sustainable development, in which, however, they may not have a solid background. This could then jeopardize the quality of the ethics and sustainable development education provided. The alternative is to bring in a professional educator in ethics and sustainable development, but his might defeat the purpose since the students might come to think that ethics and sustainable development are irrelevant or additional non-core subjects, since their usual teachers do not provide this themselves. Therefore, this chapter suggests that there is an important need for teachers in general to learn about ethics and sustainable development and how to integrate them in a relevant and effective way in their courses.

The aim of this chapter is to give support and inspiration to teachers on the integration of ethics and sustainable development in education programs and teaching courses. The structure for *constructive alignment* (Biggs and Tang 2007) is used to describe and reflect upon how ethics and sustainable development can be integrated into education development in an effective way, with the aim to support students to gain relevant and deep learning. The first step in constructive alignment is to formulate *intended learning outcomes*, followed by the design of *teaching and learning situations* that should support this learning, and finally the design of the *assessment* that should evaluate how well the students fulfil the learning outcomes.

Intended learning outcomes

Examples of learning outcomes for ethics and sustainable development can be found in the Swedish national degree ordinance for a five-year-long master of science in engineering degree (Swedish Ministry of Education 2006). It can be noted that both ethics and

sustainable development should be strongly connected to the specific domain of the program. According to the learning outcomes, the students who graduate should demonstrate:

- the ability to develop and design products, processes, and systems while taking into account the circumstances and needs of individuals and the targets for economically, socially and ecologically sustainable development set by the community;
- the ability to make judgements informed by relevant disciplinary, social, and ethical aspects as well as awareness of ethical aspects of research and development work;
- insight into the possibilities and limitations of technology, its role in society, and the responsibility of the individual for how it is used, including both social and economic aspects and also environmental and occupational health and safety considerations.

The intended learning outcomes for an education describe the competencies that the students must have to get their degree (Biggs and Tang 2007). The courses in their education should then contribute to this intended learning by supporting a progression in learning through the education. This could, for instance, be that the students must have knowledge about certain norms, values, ethical theories, and general approaches when it comes to dealing with issues of ethics and sustainable development (Segalàs et al. 2009).

The learning outcomes should (at least) include the competencies that are required for the degree, according to some certificate or some national requirements, such as the Swedish national degree ordinance in the example earlier. Ethics or sustainable development may not be included in such requirements but can be added at the initiative of a university, education manager, or teacher with the aim to contribute to a general, as well as specific learning, among citizens and professionals in society. Certificates and requirements for specific degrees evolve over time, and one possible driving force for change can be universities that choose to be proactive and include local requirements that go beyond the existing ones that they must follow. It can even be considered a responsibility of a university to act as a change agent towards such a development to contribute to a transformation towards sustainable development. Chalmers University of Technology chose to introduce a requirement for the integration of sustainable development before there was a requirement in the Swedish national degree ordinance (Holmberg et al. 2012).

One way to divide different types of competencies that should be aimed for includes knowledge, skills, and attitudes (Baartman and de Bruijn 2011). We might think that students at least need to *know* about values, norms, normative theories, and tools, but that they preferably also need to be able to see when these are applicable in their working life, be able to *apply* them in these cases correctly, and they also need to think that getting these things right is *important*. In the example from the Swedish national degree ordinance, the students should be able to "*develop* and *design* products, processes and systems" and "*make judgements*". Of course, sustainable development and ethics cannot be the only things which are important, for example, for an engineer, but they should think that these things are important, nevertheless. For example, it is important that the new algorithm I produce for the justice system does not impact the court proceedings unfairly. However, this does not mean that I should not also think about how to make it work as a tool and as a product on which I can make a profit.

Another dimension for competencies is the depth of learning, which can be described by a taxonomy such as Bloom's (Bloom et al. 1956) or the Structure of Observed Learning Outcomes (SOLO) (Biggs and Tang 2007), which both are taxonomies for the cognitive

domain. In line with constructive alignment, the intended learning outcomes should include active verbs for what the students should be able to do after the completion of a course. The motives for using active verbs are that such verbs better describe: the intended depth of learning, the expectations for what the students should be able to do in the assessment, and thus also what needs to be practiced in the teaching and learning situations. Some examples of active verbs in this context are that the students should be able to *describe* some normative theories (knowledge) and *apply* normative theories to *analyse* a case from different moral perspectives (skill) and *explain* why some acts are right and others are wrong. In the example from the Swedish national degree ordinance, it can be noticed that these learning outcomes are quite demanding, not at least "the ability to *make judgements* informed by relevant disciplinary, social and ethical aspects".

A question that is much discussed is to what extent the learning outcomes should require a change of the students' norms and values, i.e., their attitudes. A strong but common opinion is that education should be value neutral or value free and not force any opinions upon the students, and instead focusing on making them conscious decisions through knowledge and skilled through methods and tools. However, the 'attitude competency' is connected to norms and values and can be described as "a capacity that exists in a person that leads to behavior that meets the job demands which brings in desired results beyond knowledge and skill". Sustainable development is furthermore a value-laden and deeply normative concept (for example, UN 2015), where there can be an expected ambition to foster good for citizens.

For example, in many business schools today, future economists are educated in ethics because it has been found that economists only thinking about maximizing profits (i.e., Friedman thinking) which can lead to suboptimal results at a societal level. This because such moods of thinking and acting more easily produce social and ethical dilemmas like the 'tragedy of the commons'. Here, when everyone acts in their own self-interest, they produce worse results than if they would have acted on more altruistic motives that would have provided more value for more people instead. In the example from the Swedish national degree ordinance, it can be also noted that it is explicit that the normative societal goals for sustainable development should be aimed towards learning outcomes that are *not* value neutral. The third learning outcome, which is a learning outcome for attitudes, require that the students should "demonstrate insight into . . . the responsibility of the individual for how it [technology] is used, including both social and economic aspects and also environmental and occupational health and safety considerations".

In addition, it should be noted that no (or almost no) educational effort is, strictly speaking, 'value free'. When we educate students in science or the humanities, we often try to imbue them with certain values or norms, for example, based on good research practice, or what a good theory is, etc. For example, a goal (a value) when it comes to physics is not only to produce theories which can withstand rigorous testing. We also want theories that are simple, graceful, and have a high degree of explanatory power. There is also a wide variety of norms we try to teach students such as how to behave in a lab, how to write a paper, and what it is to cheat and instil in them the values that they should not cheat. However, there are many norms and values we regularly try to teach students, but sustainable development and ethics are relatively new topics to education.

There are also notable differences between education for sustainable development and education in ethics when it comes to norms and values. This difference can be noticed in their formulation: the aim of education *for* sustainable development is not just to support

the development of competences *in* a subject but also to contribute to a change in society *towards* sustainable development. Therefore, one part of education for sustainable development is focused on a normative goal even though there can be variations in how sustainable development is defined. However, the UN Sustainable Development Goals are currently the most prevailing definition (UN 2015). Education *in* ethics lacks this normative focus and is therefore more like other subjects in education in the way that the aim is to support the development of certain learning competencies. An important part of learning in ethics education can be that students should get insight into their *own* norms and values, and in education for sustainable development that the students get insight into the norms and values of *society*.

Teaching and learning situations

Teaching and learning situations in a course should support the fulfilment of the intended learning outcomes, and students should get opportunities to practise these competencies (Biggs and Tang 2007). Practice together with feedback is a good combination to support students' learning and to make sure that they are on the right track. Additionally, motivation is maybe an even more important factor to enhance learning (Deci et al. 1991).

One way to motivate students in this domain is to demonstrate the relevance of ethics and sustainable development to their profession and future career. An effective way to do this can be to integrate ethics and sustainable development formally into course programs. For example, design for recycling and responsible design can be included in product development courses (Enelund et al. 2013) and gender equality in courses in ergonomics in mechanical engineering education. Other examples are personal integrity, i.e., privacy, that can be included in courses on security and big data in information technology, and environmental risk assessment for emissions of substances in chemistry education. Additionally, the teaching can include cases from the profession that can be used, for example, to show how it can go wrong or how a judgement was made. Sometimes in ethics education one can see extreme examples of cases including those involving whistle blowers and attracted large media attention. One such famous example is the scandal in 2015 when Volkswagen had intentionally programmed some of their diesel engines to produce up to 40 times less nitrogen oxide emissions during laboratory tests compared to real-world driving testing with the purpose to be able to sell these cars in the United States (Hotten 2015). It is valuable to include such examples in teaching, but it is perhaps favourable to focus on cases that are less extraordinary and more like situations that students will more likely encounter in their professional lives (Harris et al. 1997; Lynch and Kline 2000), which is in line with the insights given by Tormey see Chapter 8.2 in this volume).

In the example from Sweden on the MSc in engineering degree, one of the requirements is to have "the ability to make *judgements* informed by relevant disciplinary, social and *ethical aspects*". One part of this requirement is to have knowledge on any ethical considerations. There are many examples of professional codes of conduct that often includes a variety of ethical considerations, such as loyalty towards different actors, safety aspects, and environmental issues, which should be considered in connection to different actors that one can encounter in a profession, such as employers, colleagues, customers, and the public (Doig and Wilson 1998). Such codes of conduct can then be used in practice exercises in the teaching of ethical considerations. However, it can be challenging to use codes of conduct for guiding judgements on decision making in real-life scenarios. There is a wide range of

norms and values which might differ from context to context. In addition, we also have a wide range of normative theories which are not always that straightforward to apply. As a result, there is no single algorithm to give us the right answer when it comes to what we should do to produce an ethically viable result or to achieve sustainable development goals. There are, however, decision-making tools that can be used when trying to come to make ethical decisions. These are not algorithms for producing perfectly ethical decisions either, but they can often be of much help if the student and teacher are knowledgeable on the expected norms, values, and normative theories that are relevant to the decision at hand. To make judgements to decide on actions, especially in more complex situations, it can be useful to use a well-structured framework such as the ethical cycle (Poel and Royakkers 2007). Such a framework gives the student an opportunity to apply knowledge, practise skills, and get critical insights into their own attitudes (i.e., norms and values), which is also an important component in ethical competencies.

The ethical cycle (Poel and Royakkers 2007) is an example of a systematic tool for decision support. It has been developed by philosophers at Delft University of Technology with the purpose to be used in education to support engineering students to approach moral problems in a structured way. However, the tool can fulfil a broader purpose than just in education and can be a valuable asset for professional application also. The ethical cycle is mainly useful when the moral problem in a specific situation involves many stakeholders and is complex to solve given that there is no obvious answer for how one should act. An advantage is that the tool includes a broad analysis to cover many important aspects or perspectives that help result in a well-founded decision for the decision maker that should be able to stand up to and present transparent moral arguments and reasoning. The five phases in the ethical cycle are:

1. *Moral problem statement*: in which the problem is clearly stated and the actors who have to act are identified.
2. *Problem analysis*: in which stakeholders and their interests and conflicting values are identified, as well as facts that are relevant and important but may be uncertain and missing.
3. *Options for action*: in which not just black-and-white strategies are identified but also more creative middle-way strategies.
4. *Ethical evaluation*: in which the options for action are assessed from different moral perspectives (i.e., norms and values) with the support of normative theories.
5. *Reflection*: which should result in a final decision for how one should act in the specific situation and in which the relevance of different moral perspectives for the specific situation is critically reflected upon.

The value of the ethical cycle framework in comparison with other decision support tools in ethical decision making is that the ethical cycle involves more fundamental normative theories and a broader array of relevant norms and values. Therefore, when using the ethical cycle, we might examine what the different norms are according to the company we work for as well as the more refined normative theories such as utilitarianism and Kantianism. This results in potentially a more legitimate and reliable review of ethical responsibilities since we have examined a broader array of contextual norms and values.

As mentioned before, it can be quite demanding to gain the required competencies in ethics and sustainable development in just one course or part of a course. To support a

progression in learning, ethics and sustainable development are preferably integrated in several courses in a program (Hanning et al. 2012). Experience has shown that a three-step approach can be beneficial: 1) introduction, 2) teaching, and 3) application (Lundqvist and Svanström 2016). In the first step, ethics and sustainable development are introduced early in a program together with an introduction to the profession, with the aim to enhance motivation by showing the relevance of ethics and sustainable development in the future career of the students. In the second step, the students gain knowledge about ethics and sustainable development in general as well as more domain-specific knowledge and tools and methods that can be used in this context. In the last step, this knowledge is applied in preferably several courses within the domain for the program as well as in BSc and MSc theses when relevant.

Assessment

A summative assessment has the purpose to assess how well the students fulfil the intended learning outcomes of a course and should be designed so that the students can demonstrate the abilities gained (Biggs and Tang 2007). In ethics education, a reflective essay can be used to fulfil this purpose or an argumentative text where students must take a stand on an issue. A challenge here may be to convince the students that the assessment does not assess *their norms and values*, but their knowledge, skills, and their insights about their own attitudes (i.e., norms and values) and other norms, values, and normative theories relevant to the case they are set to analyse. This can be done by clearly communicating how well the *argument* is formed that is then assessed and not the *results* of the argument itself. Examples of assessment criteria can be that the students should show that they have knowledge about ethical considerations and how these can be valued differently, depending on perspective, and that an opinion is based on facts as well as values and a distinction is made between these. An example can be an argumentative text about nuclear power. An argument for nuclear power is that it can be used instead of fossil fuels and in this way reduce climate change pressures, but an argument against nuclear power is the production of associated radioactive waste. A student can get a pass result independent of whether he or she is arguing for or against nuclear power, but the text must include arguments based on the values associated with the potential negative consequences of climate change compared to nuclear waste, as in utilitarianism, and based on norms on how one should act such as the precautionary principle, as in deontological ethics.

As we have reflected upon earlier, there is a notable difference between education for sustainable development and ethics education that also has a large impact on the assessments chosen. For both there is a value-neutral assessment of the students' competencies, for example, concerning how well they can explain moral theories or sustainability principles and how well they can apply these in a decision support tool such as the ethical cycle or in life cycle assessment. In ethics education, a teacher can encourage and expect that students take a stand for their own opinions, and if the students use the tools in an appropriate way and have well-founded arguments, they can get an approved mark from the teacher independent of the opinions that they have expressed. However, in education for sustainable development, students are usually not expected to argue against the norms and values in society for sustainable development, but here the assessment is instead focused on the knowledge of the societal norms and values and the ability to apply this knowledge, for example, in decision support tools.

Conclusion

Education for sustainable development should result in professionals and citizens who are motivated to act according to the values of sustainable development and who can contribute to the change of prevailing norms to assist development towards sustainability. Thus, education for sustainable development requires competencies in ethics. Ethics and sustainable development should be taught in context and should include content that is relevant for the profession, which can enhance motivation and support deep learning for the students. This chapter therefore suggests that there is an important need for teachers in general to learn about ethics and sustainable development and how to integrate them in a relevant and effective way in their courses.

The structure for constructive alignment can be a useful and effective support for teachers in their planning and development of education in ethics and for sustainable development to reach good quality. The formulation of intended learning outcomes for courses and programs is the necessary and important first step since learning situations and assessments should be aligned with these. Teachers and universities can be proactive to make sure that competencies in ethics and for sustainable development that are relevant for the students in their daily lives as citizens and in their professions are included and explicit in learning outcomes. The learning outcomes should include competencies for *knowledge,* such as about values and norms, and for *skills* such as to apply normative theories and tools. The learning outcomes should also include competencies for *attitudes*, but here there is a notable difference between education for sustainable development and education in ethics. An important part of the learning in ethics education is that the students should get insight into their own norms and values, whereas in education for sustainable development the students should get insights into the norms and values of society.

Teaching and learning situations should support students' deep and long-lasting learning of the intended learning outcomes. Examples and cases similar to situations that the students will likely encounter in their lives and careers can show the relevance and enhance motivation. To make judgements to decide on actions, especially in more complex situations, it can be useful to use a well-structured framework such as the ethical cycle that can give the students an opportunity to apply knowledge, practice skills, and get critical insights into their own attitudes (i.e., norms and values), which is also an important component in ethical competencies. To support a progression in learning, ethics and sustainable development are preferably integrated in several courses in a program, and experience has shown that a three-step approach can be beneficial: 1) introduction, 2) teaching, and 3) application.

In ethics education, the assessment can be in the form of a reflective essay or an argumentative text where students must take a stand on an issue. A challenge here may be to convince the students that the assessment does not assess their own norms and values, but their knowledge, skills, and insights. This can be done by clearly communicating that it is how well the argument is formed that is going to be assessed and not the results of the argument itself. The differences between education for sustainable development and ethics education also have a large impact on the assessments chosen. In ethics education, a teacher can expect that students take a stand for their own opinions, while in education for sustainable development, students are usually not expected to argue against the norms and values for sustainable development in society.

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