Sustainable development in terms of democracy—an educational challenge for teacher education

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Introduction

In autumn of 2001, a revamped teacher education program started in Sweden. The new program is in many respects different to its predecessor. One of the most radical changes is that all student teachers, no matter what age groups they plan to teach later, study several courses in general education together. This block of courses, which makes up 60 points of the entire program (one semester of full-time study is equivalent to 20 Swedish academic points), covers “knowledge of the ecological conditions governing life on earth and basic knowledge of ecology and the preservation of biodiversity” (Prop 1999/2000:135 p. 18). Thus, pre-school teachers, elementary-school teachers and upper secondary school teachers are jointly responsible for teaching this area of knowledge. As the directives for the new teacher education program are rather open-ended in their wording, there has been a great deal of room for individual schools’ interpretations. Växjö University chose to design an interdisciplinary 10-point course called Interdisciplinary Perspectives on Sustainable Development, which is taught within the general education course block. All student teachers take this course during their first semester of study.

The term sustainable development had its breakthrough at the time of the “Brundtland Report,” where it was defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Our Common Future, 1987. This broad definition has opened up for varied interpretations (Skolverket, 2002; Ekborg, 2002). Our usage of the term is in line with the definition stated in Agenda 21 (UNCED, 1992), which establishes that sustainable development embraces ecological, economical and social dimensions. It is therefore important to emphasize that although this article will focus on science (i.e. the natural sciences: biology, physics and chemistry), education for sustainable development needs to make broad interdisciplinary efforts.

The ambition at Växjö University has been to follow the intentions expressed in the directives for teacher education with respect to fundamental values, co-operation, a holistic perspective, interdisciplinary subject studies and sound knowledge about ecology and biodiversity. Since a large part of our course is devoted to science, we offer a knowledge base concerning the scientific perspective of sustainable development and at the same time we are responding to the call for greater science skills in today’s student
teachers. The initial resistance against being “forced” to study science has been striking. It has been shown that the great majority of student teachers actively chose to avoid studying this area in high school\(^1\). One student expressed their dissatisfaction in the following way:

*You see, you study the science in junior high. I thought it was really difficult, so that’s why I chose the social studies and economics program in high school. I thought that it would steer clear of everything to do with the science. But no. Even then we had two years of science. Now I’m going to be a social studies teacher, and what do you think is on the agenda? That’s right, more science!*

In light of this striking lack of interest in the science, we asked ourselves this question: What are the challenges facing a teacher education program that is supposed to prepare all future teachers to teach sustainable development based on a scientific and democratic approach? In order to get a better picture of the future teachers’ attitudes towards science we asked all of the students starting the *Interdisciplinary Perspectives on Sustainable Development* course to write an essay describing their own experiences with and attitudes towards science. Reading the papers was a grim task in some cases, as many disagreeable school experiences were reflected. However, many students clearly expressed the idea that knowing about the scientific aspects of environmental issues as ecology and biodiversity is necessary for maintaining a democratic society.

The main aim of this article is to discuss sustainable development and democracy within the framework of a teacher education program, focusing on scientific knowledge and progress in particular. By way of introduction, we provide an overview of the debate regarding sustainable development that preceded the directive on the Swedish teacher education program. We also present the findings of our survey of student teachers’ previous experiences with and attitudes towards science. Following this we discuss the relationship between sustainable development and deliberative democracy. By way of conclusion, we discuss the educational challenges regarding the student teachers’ education in sustainable development that the teacher education program could possibly face.

**The new Swedish teacher education program**

The work to develop directives for the reformed Swedish teacher education program took place between 1995 and 2000. Following this, staff at the country’s universities and colleges worked intensely to develop the program in order to launch it in autumn 2001. There is a great deal to be said about the new program, but we will limit ourselves to the areas that are relevant to the Växjö University course called *Interdisciplinary Perspectives on Sustainable Development*. This means that we have chosen the aspects of the reform efforts that partly focus on the relationship between democracy and

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\(^1\) Cf. Lindahl, 2003.
sustainable development, and partly the relationship between the development of scientific knowledge and sustainable development.

The government’s directives for the teacher education program’s reform stress the importance of a number of different areas, including the fact that the program should firmly establish the principles of the school’s fundamental value system, as stated in the various curricula, and work to increase recruitment to science programs (Dir 1997:54, p. 6-7).

In early 1997, the Swedish Parliament established a committee whose task was to draw up the guidelines for the new teacher education as ordered by the government. The committee’s final report was presented in May 1999 (SOU 1999:63). The committee suggested that the teacher education program’s new structure contain three well-integrated parts: general education, teaching subject(s) and specialization(s). Each student should be given greater opportunities to create an individual educational profile by choosing from different teaching subjects and specializations. The general education area should cover the essential knowledge and skills that are essential for teachers, as well as the study of important interdisciplinary subject matter. A suggested example of essential knowledge and skills was:

“…the working professionals’ civic assignment, democracy and fundamental values. This entails analyses of the foundation of values, ethics, morals, equality, equal opportunity and democracy that are the basis of society. This can be achieved by examining and showing regard for international declarations and treaties during the education (ibid., p. 128).

Interdisciplinary subject studies can entail:

“...the relationship between humans and their environments, how humans influence the environment and how they adapt to their surroundings. The theme can give insight into how people describe the laws and regularities they have observed in nature and the universe. Additionally, analyses of mankind’s influence on nature, the consequences of this influence for all living things, and our struggles to regulate this influence can be included” (ibid. p. 129).

The “teaching subjects” area would be made up of subject studies that the student teacher intends to work with, and “specializations” would mean either advanced studies in these subjects or branching out into other particular areas of study.

Regarding the lack of interest in science studies, the committee stressed the importance of a concerted effort at all educational levels to reverse this trend. The committee listed several possible ways to encourage interest in science, for example, by creating continuity through interdisciplinary study blocks and co-operation between disciplines. According to the committee, this way of working needs to gain a foothold in teacher education (ibid. p. 348).

The governmental bill that was formulated in May 2000 (prop 1999/2000: 135) followed the essentials of the guidelines presented in the committee’s report. Environmental
conservation and a solid knowledge of ecological issues were highlighted, with particular attention paid to fundamental values. This was clearly expressed in the following words:

“... student teachers must analyze the fundamental values concerning democracy, ethics, morals and equality—the foundations of society. It affects interpersonal relationships as well as people’s way of relating to the environment and other living things (...) Knowledge of the ecological conditions governing life on earth and basic knowledge of ecology and the preservation of biodiversity shall be included in all teacher education programs” (ibid. p. 18).

The bill was passed by the Swedish Parliament at the end of October 2000. The guidelines for the new teacher education program came into effect on July 1, 2001.

With the new guidelines in mind, at Växjö University we chose to develop a course within the general education area: Interdisciplinary Perspectives on Sustainable Development. The course, which is taken by all student teachers during their first semester, is interdisciplinary in that it covers sustainable development seen through the perspectives of several disciplines, e.g. economics, social sciences and the natural sciences, all based on the definition of sustainable development given above. However, the main emphasis of the course is on the natural sciences, in response to the local and national call to increase recruitment of persons with solid science skills.

Student teachers’ previous experiences with education in the natural sciences

Many studies have been looked into students’ attitudes towards the science and science education. Despite this, little is known about how student teachers’ attitudes and experiences with regard to science2. In light of the new directive that all teachers shall be responsible for teaching about issues such as the ecological conditions governing life on earth and basic knowledge in ecology and the preservation of biodiversity, we thought it pertinent to chart student teachers’ preparedness to deal with their future training3.

Survey design and procedure

In 2001’s autumn semester, 357 student teachers were admitted to Växjö University, of which 45 (13%) chose the program to become science teachers, (i.e., teachers of physics, chemistry and/or biology). During their first week of study they were given the following task:

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2 This was covered to a certain extent by Ekborg (2002) and Lager-Nyqvist (2003).

3 A ten-year-old study of 161 ninth-graders and third-year high-school students showed that basic knowledge in science was considered important by most of the students, but the that the lessons seemed old-fashioned and lacking connection to everyday life. The students thought that science was hard to bring to life. The survey was largely limited to multiple-choice items, with limited space for essay answers (UngdomsBarometern, 1994).
Read chapters 3-5 in Svein Sjøberg’s book *Science as education*, paying particular attention to chapter 5 (Why should everyone learn about the natural sciences?). Summarize the reading (one A4 typewritten page per chapter). The important thing is to give ample space to your thoughts and reflections in response to the reading that you want to present at the up-coming seminar, so do not limit yourself to merely summarizing the content of the book.

Bringing about an experience-based reflective process, in this case about learning science, is not easy. An all-too-freely-worded task, for example, “describe your previous experiences with learning science in school” can yield relatively superficial answers. Based on the tradition of research that aims to set experiential “tacit knowledge” in motion, we chose the class text in order to give the students a common object to “scrape” their experiences against. Sjøberg’s (2000) text takes up topics such as high-school students’ good level of knowledge in Sweden and Norway compared to other nations; that too few students with a science background apply for teacher education programs; and that scientists were previously seen as heroes but nowadays are thought of as “crooks.”

Later on, the students were asked if they would mind submitting their texts for the research project. 264 of 376 (70%) agreed, the others declined. These 264 texts have been qualitatively and quantitatively analyzed, focusing on the attitudes towards and experiences of science that they reflect. We limit ourselves here to presenting two aspects of the representative student voices in the study: (a) how students express their attitude towards and experiences of science, and (b) student teachers’ view of science skills and knowledge.

In a nutshell, the summary shows that during elementary school and high school, a great many students feel that the science lessons are theoretical, and that science is difficult to understand, based on rules, and quite often boring. In this way our study is not all too different to other studies done on students’ attitudes towards science (cf. Ungdomsbarometern, 1994). However, what our study captures—and what makes it unique—is future teachers’ attitudes towards science, i.e., the attitudes of the group who within a few years will be responsible for teaching science in Swedish schools.

Can one draw any general conclusions about soon-to-be teachers’ attitudes towards science from this limited study? Statistics from The National Agency for Higher Education (www.vhs.se) and Statistics Sweden (www.scb.se) show that the group of students studied in Växjö match well with the country as a whole in terms of gender, educational background, and choice of teaching subject within the teacher education program.

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4 Within the school of research that developed within professional expertise and technology at The Royal Institute of Technology, researchers have found that experiential knowledge is not easily captured using direct questions. Based on Wittgenstein’s later philosophy, the dissertations of Bo Göransson (1991) and Maria Hammarén (1999) show that experience needs to be challenged by the examples of others. For example, literary works, films, plays and philosophical texts can be related to the actual issues one wishes to address.

5 For a more thorough presentation of the study’s conditions, quantitative analysis and generalizability, see Working paper (Gustafsson, 2004).
program. Their attitudes and experiences with respect to science subjects are comparable to other studies in this area. Thus, we believe that it is quite likely that this is the way it is in the rest of the country when it comes to future teachers’ attitudes towards science.

Future teachers’ attitude towards and experiences with science

Let us take a look at how students express their attitudes towards and experiences with science. Many students think that objective knowledge in terms of correct and incorrect takes up too much space during science lessons. This perspective places the teacher in the center as the bearer of all knowledge, while the experience that the students bring to class is of lesser importance.

*When you’re a student, learning science is just not that important. All you learn from the teachers and textbooks is proven theories, laws and concepts that can hardly be questioned. This makes science seem authoritarian, or maybe undemocratic.*

*When I took physics in junior high school I thought it was a fun and interesting subject (...) Later on in high school it was completely different, with lesson after lesson looking exactly the same. The teacher would go through a chapter on the blackboard and at the end of the lesson we had to do the exercises at the back of the book. This is how it was day after day. It’s no wonder you eventually lost your motivation.*

It could be science subjects’ hierarchical and linear structure that has led to the great reliance on textbooks, and thus a one-sided, lecture-based approach to science teaching. It is difficult to break away from a lecture-based approach as long as teaching is carried out at an abstract level without any connection to the students’ personal experience.

*Teachers of these subjects, at least in my own experience, have a hard time bringing real-world experience to their teaching. They tend to just go on and on about molecules and atoms, which doesn’t really make any lasting impression on the students.*

Despite the fact that the subject matter of science deals directly with the conditions that govern our very lives, there is often a large gap between subject matter and the lifeworld. There is general agreement within modern educational research that communication is of the utmost importance for the learning process (Dewey, 1916/66; Vygotskij, 1962; Säljö, 1994a, 1994b, 2000; Marton & Booth, 1997, etc.). Learning is discussed more and more in terms of relational and situated processes in which the learner’s experience makes up the grounds for learning as well as provides the motivation. However, a relational approach to learning requires that the teacher problematize the subject matter in a way that encourages the students to engage in discussion and reflection. The teacher students we surveyed believe that the study of science can challenge our preconceptions, but that it is often taught in a dogmatic manner that hinders discussion.

*I think that it’s more difficult to get people interested in science just because you really have to abandon a lot of thoughts. Science is very clear about “this is the way it is,” which I think scares off a lot of people.*
Perhaps it is its potential to challenge our thinking that could make science attractive and provide and impetus for learning, that is, if it weren’t presented in terms of “this is the way it is.”

Many of the student teachers in the study found certain things missing in their previous science lessons: connection to real life, communication, ethical and moral discussions, and existential and emotional questions.

_I can only look to myself, who like many others, liked biology most of the three subjects. I think it’s because the subject was in some ways easy to study and relate to. Nature, animals and people—they are always around us and are a part of every student’s reality. But molecules and atoms are more abstract, it’s harder to conceptualize [...] What’s impossible to understand most often becomes uninteresting [...] If you want to increase the interest in these subjects you have to think about how to present them and explain them to the young people. You have to get them to understand that they’re related to their own realities._

As one student believes, involvement is encouraged when students see that knowledge about science is related to ethical standpoints. The student writes:

_“After recently having studied science and geography, I think that the science is interesting when you talk about the future, new technology, modern techniques, global environmental problems or other things we can actually influence.”_

Students want science to be taught in a way that involves all of our senses and thus elicits emotional involvement. One student writes:

_Simply put, the way science has been presented is too stuffy and unsexy to win the interest of the general public._

Despite negative experiences, the great majority agrees that knowledge of science subjects is necessary for democratic society. Many feel that we cannot influence societal development if we lack well-founded arguments.

_Quite simply, you need a scientific foundation in order to understand a lot of what is going on. It’s important to understand and explain the world around us in order to avoid being an outsider. You can’t tell if something is unnecessary or wrong if you don’t know at least something about it. It’s also true that you can’t influence much of what goes on if you don’t understand anything about it._

**Student teachers’ views on science skills**

What kind of skills do the student teachers think a teacher should have in order to be a good science teacher? Or put another way: What kind of skills and knowledge do they want to develop during their teacher training in order to deal with the topic of sustainable development in a satisfactory manner? The following students’ voices capture the essence of the study’s findings quite well:
Science needs to be related to things that have to do with ethics and values. We ought to concentrate on using our knowledge to set to rights all the things we’ve done wrong in the world.

Science is a part of our cultural heritage, and its subjects could benefit by emphasizing this more. The connection should perhaps be stronger and in this way contribute to students’ general knowledge—not just in science but in other subjects as well.

I think that in the future we are going to need completely different angles of approach to science subjects. In part we need greater understanding for nature and the environment, perhaps a bit about new technologies and how they work, genetic engineering and its ethical aspects, but also a readiness to survive on nature’s own terms.

As we interpret it, student teachers are asking to be provided with competence that gives them a broader educational foundation in science subjects. When we use the term education here we mean a teaching and learning process that doesn’t limit knowledge to a means to achieve specific goals, but a process in which new insights lead people to not only develop but to fundamentally change (Liedman, 2002). This type of educational perspective on science allows us to approach its teaching based on democratic grounds.

**Sustainable development and democracy**

In general, the students who began their teacher training at Växjö University in 2001 had unpleasant experiences of science lessons in elementary school and high school. In light of these experiences they are asking for courses that will provide them with a broader educational foundation. As one student mentioned, we can’t just turn over all responsibility for the environment and societal development to the experts. The student writes:

*I firmly believe that science would have much to gain if people thought it were in the interests of the general public, not just for a small group of people, that is to say, an elite group who pushes development forward.*

This student could be asking for a more democratic approach in which the citizens take a more active role in opinion building. In the directives for the new teacher-training program, there is a clear connection between a democratic approach and knowledge about environmental conservation efforts and the ecological foundations of life. In other words, one can say that sustainable development as an interdisciplinary field of knowledge embraces the dual assignment of the schools: to transmit knowledge and

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6 It is important to note that the student teachers in our study think that scientific knowledge is important for and in teaching about sustainable development. This confirms the results from a Danish survey of 845 students in elementary school and high school that showed that the students themselves thought that science provided the most valuable knowledge base for strengthening their belief in their own action possibilities, defined as: ability, motivation and the desire to take an active part in finding democratic solutions to environmental problems (Mogensen & Nielsen, 2001).
foster independent, democratic members of society (Englund, 1997; Fritzén, 2003a, 2003b, 2003c).

**Democracy in terms of deliberation**

A democratic society presupposes democratic citizens. But what exactly does being a democratic citizen entail? The answer to this question is by no means given. Democracy can be called, in William B. Gallie's words, “an-essentially-contested-concept” requiring constant critical analysis and discussion (Gallie, 1955). Mikael Carleheden (2002) has shown—based on the ideas of German social philosopher Jürgen Habermas—that the concept of democracy has changed and evolved through time.

It was in connection with the breakthrough of modernity during the 1700s and 1800s that democracy began to take shape. At that time, the “supremacy” of religion was supplanted by ideas about justice and democracy, and a “liberal paradigm of law” was formed. The liberal paradigm of law puts the rights of the individual in the center and a so-called negative ideal of freedom was formulated. Carr & Harnett (1996) write:

*It is for this reason that the liberal conception of freedom is ‘normally defined negatively, as a condition in which one is not compelled, not restricted, not interfered with, not pressurised’.*

In connection with the decline of bourgeois society around the end of the 1800s, “private society” was replaced by a mass-democratic social state, in which political power was separated from property and capital, and public rights were given precedence over private. The State thus became responsible for ensuring the general welfare of the citizens. Representative democracy in terms of “one person, one vote” evolved. It wasn’t until a hundred years later that democracy began to be talked about in new terms. In the beginning of the 1990s, Habermas formulated his “procedural paradigm of law”:

*He uses this term to emphasize this paradigm gives privilege to procedures that make civic freedom possible, that is, procedures that make it possible for citizens become the authors of law and justice* (Carleheden, 2002, p. 48).

The procedural paradigm of law means that the role of the citizen is changed from being an “addressee” to being an “author.” By taking a procedural or deliberative stance, citizens can participate in shaping public opinion. Seen through a deliberative perspective it is not the individual’s right to freedom from other individuals and the State (negative freedom), but the individual’s (positive) freedom to communicatively form opinions and convince others, and therefore convince the State (ibid, p. 49).

If we examine recent years’ studies on democracy in Sweden, we find that the deliberative paradigm, in which the citizens are expected to take a more active role, has greatly influenced developments (SOU 2000:1, Prop 2001/02:80). The deliberative paradigm has also influenced The National Agency for Education’s way of interpreting issues relating to fundamental values (Skolverket, 2000).
Deliberation in teaching practice

What can a deliberative approach mean for the practice of teaching? Representative democracy is mainly about electing representatives to decision-making groups, the conditions for such elections and their results in the form of compromises and majority decisions. In the world of the school we recognize this type of democracy in, for example, student councils. During the 1980s, pupils’ involvement in their own teaching was focused on more and more. For example, in the choice of study themes, working methods, student councils, etc., pupils were given more opportunities to make their voices heard in discussions within and between different groups. However, the interest does not extend beyond the needs and interests of the class or group. Deliberative democracy places further emphasis on discussions in democracy. Christer Fritzell (2003a) writes:

In discourse of this nature, it is vital that the participants maintain mutual respect and remain relatively impartial, and that there is equality with respect to the right to speak and obligation to listen. Each person must have the ongoing right, implicitly or explicitly, to voice their yes or no, and be prepared to give justification for it. All parties in the dialogue need to treat others as if they have something valuable to contribute, and that their opinions are important. Part of this means not rejecting any arguments that you (still) haven’t understood. By taking each other’s perspectives and including as many as possible in the communicative frame of reference, it is thought that a form of impartiality can be reached (p. 33).

A deliberative perspective means having students delve deeply into certain areas relevant for the curricular aims, and having them test how well their own arguments hold up when seen from different perspectives. But here communication even takes on a kind of universal respect, or in Hannah Arendt’s words, “expanded thinking.” In discourse striving for “expanded thinking,” consensus or unanimous agreement is not the most important thing. Instead, it is the expected communication “with others I know I have to reach consensus with in the end” (Benhabib, 1994, p. 25).

Deliberative democracy and sustainable development

Ultimately, sustainable development is about sustainable people in a sustainable environment. Based on international declarations and treaties such as the Rio Declaration and Baltic 21E, issues such as these require “expanded thinking.” The discussion and debate need to reach beyond our own personal needs and interests, and in some way embrace everyone who is affected by our decisions. Dealing with issues such as a sustainable society places particular demands on education. It is not about transmitting ready-made solutions, but more about a deliberative process characterized by mutual

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7 Within the framework of a research and development project at Växjö University, led by professor Christer Fritzell, we have been able to thoroughly examine questions related to learning and deliberation. See Fritzell (2003b); Fritzén, (2003c); Gerevall (2003); Krantz (2003).
respect and exchange of viewpoints, and considering different arguments. In order to keep such discussions from being a mere exchange of personal opinions, the arguments should be based on scientifically grounded knowledge. For example, arguing about the greenhouse effect and genetically manipulated foods within the frame of a deliberative process is not meaningful if the argument is not based on scientific knowledge. Both Axelsson (1997) and Ekborg (2002) illustrate the connection between science and democracy. Ekborg writes: “Students in school should learn science in a way that allows them to understand and participate in societal debates that contain elements of science” (p 31). Axelsson believes that for this to happen, teachers need to “change how they teach ecology so that the students develop environmental consciousness and influence” (Axelsson, 1997, p. 9).

Trying to live up to the ideals of “expanded thinking” in the classroom puts great demands on both subject matter (what) and teaching methods (how). Sustainable development will not become democratic knowledge until classrooms can create the necessary conditions for democratic action. In other words, the main questions within educational theory—what and how—need to become an integrated whole in teaching practice.

**Sustainable development—an educational challenge for teacher training**

There are, of course, many different ways to approach sustainable development in educational theory. We believe that a deep conceptual understanding combined with “expanded thinking” with regard to sustainable development can best be achieved within the framework of deliberative processes. This doesn’t mean that it is the only way or the correct way; it should be seen as one of the many perspectives worthy of emphasis.

Processes marked by openness, mutual understanding and exchanging points of view make great demands on both the educational system and its participants. In order shed some light on the question of what these demands can mean for teaching practice, Jürgen Habermas’s theories on communication and deliberation (Habermas, 1984, 1987) are useful. According to Habermas, deliberation can be maintained with the help of a number of validity claims. Validity claims are formulated through communicative action related to three distinct social spheres: a cognitive-rational sphere which mainly deals with our relationships to the material—objective—world, a norm-governed sphere which manages our social relationships, and a subjective sphere which focuses on personal identity. Habermas writes:

We can identify these intuitively if we keep in mind that in communicative action a speaker selects a comprehensible linguistic expression only in order to come to an understanding with a hearer about something and thereby to make himself understandable. It belongs to the communicative intent of the speaker (a) that he perform

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8 Deliberation comes from the Latin deliberare, which means to weigh well, to consider maturely, to take counsel, etc.
a speech act that is right in respect to the given normative context, so that between him and the hearer an intersubjective relation will come about which is recognized as legitimate; (b) that he make a true statement (or correct existential presuppositions), so that the hearer will accept and share the knowledge of the speaker; and (c) that he express truthfully his beliefs, intentions, feelings, desires, and the like, so that the hearer give credence to what is said (Habermas 1984 s 307).

If one relates the above line of reasoning to sustainable development, one could say that the objective sphere embraces the type of scientific knowledge that can be challenged in terms of correct or incorrect. For example, a discussion about the use of fossil fuels needs to base its arguments on the second law of thermodynamics, the knowledge of various chemical reactions, photosynthesis, etc. Examples from the social sphere are the norms and values that are formulated in international declarations and treaties regarding the use of fossil fuels. Arguments in the normative sphere can only be contested through assertions that they are wrong. In the subjective sphere there are demands for truthfulness, i.e., demands for correspondence between what we mean and what we actually say. The validity claims of truth, normative rightness and truthfulness are implicitly contained within spoken communication, and demonstrated in action.

Taking a deliberative approach to teaching practice requires deliberative education, i.e., examining the subject matter through objective, social and subjective perspectives (Fritzén, 2003b). Within deliberative education it is impossible to separate content (what) from methods (how). In other words, one can’t teach about international conventions without taking subjective matters into account, just as one can’t teach about photosynthesis without first discussing how photosynthesis influences our everyday lives as citizens. Deliberative education is general in the sense that its validity permeates the entire educational system, from pre-school to higher education. Of course, the standards of objective knowledge and the ability to understand norms and values and relate them to oneself vary at the different levels, but we believe that the basic principles are the same.

Perhaps sustainable development, with its foundation in science and democratic teaching and learning, can serve as the wake-up call needed to challenge the theory of educational traditions that are still greatly predominant in both teacher training and the schools themselves. These traditions have systematically separated knowledge of subject matter from issues about fundamental values, and vice versa. In turn, this has led people to think of science as being far from the realities of everyday life, and of democracy as something that doesn’t have anything to do with schooling and educational content.

Conclusion

According to the Sweden’s current degree ordinance, as of 2001 all elementary- and high-school teachers are responsible for teaching about sustainable development. Sustainable development, as it is defined in international agreements, includes ecological, economical and social dimensions. We have limited our discussion to one important aspect of sustainable development, namely the relationship between the teaching and learning of science and democracy within the framework of teacher education programs. We see democracy as mainly a deliberative process in which the participants in mutual
communication examine how well their own and others’ arguments hold up in a universal perspective. Because educational theory has seldom integrated deeper subject knowledge and democracy, it is a challenge for teacher education to take responsibility for sustainable development, as it requires exactly this type of integrated approach. An additional difficulty was brought to light by our study: teachers-to-be carry unpleasant memories and experiences of their previous science lessons with them. With the help of Habermas’s discourse theory, we have attempted to show a possible way to bridge the gap between subject knowledge and democracy. With this approach in mind, discussions about teaching practice cannot be carried out desultorily. Personal opinions and dubious knowledge are of no benefit to anyone when it comes to science. Turning around what is in some instances a negative attitude is no simple task for a teacher education program. It requires conscious, long-term efforts of educational theory. But if through teacher education programs we can challenge future teachers’ negative attitudes towards science and show them an alternative path, in the long term we may be able to break a negative trend within the entire educational system.

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