

Knowledge capabilities for sustainable development in global classrooms – local challenges

Birgitta Nordén & Elsie Anderberg

The Young Masters Programme provides young people around the world with a net-based global–local learning environment for sustainable development. The present study investigates certain aspects of the implementation of this programme in the secondary schools of a Swedish municipality, in the context of the Lund Calling project. The research focuses on critical abilities to act globally, referred to as “knowledge capabilities”, and how they relate to the implementation process of initiating global learning for sustainable development (GLSD). A phenomenographic approach and semi-structured interviews were used in the investigation of the experiences of secondary school pupils, teachers and headmasters who participated in the project. Participants’ experiences of the changes carried out are described in relation to examples of knowledge capabilities needed for GLSD. Critical knowledge capabilities found to have been developed through the implementation were: to take command, and to collaborate. Critical knowledge capabilities perceived as necessary, but not developed through the programme were: to be prepared, to act in a transdisciplinary manner, and to lead for a holistic understanding.

Keywords: global learning, sustainable development, critical knowledge capabilities, global classroom, phenomenography.

Introduction

Various recent reports (Tilbury 2010, Wals & Kieft 2010) have recognised the urgency of developing appropriate tools for learning among pupils within the complex and transdisciplinary field of Education for Sustainable Development (ESD), also emphasizing the significance of

Birgitta Nordén is MScEdu and a doctoral student at the School of Teacher Education, Malmö University, SE-205 06 Malmö, Sweden. E-mail: birgitta.norden@mah.se
Elsie Anderberg, Professor in Education, Jönköping University, Box 1026, SE-551 11 Jönköping, Sweden. E-mail: Elsie.Anderberg@hjk.hj.se

global learning. Global learning (GL) is understood in different ways; in this article it will be seen as a process, as well as one of the outcomes of educational programmes which take sustainability seriously (Anderberg, Nordén & Hansson 2009, Scott 2010). To be meaningful, “global learning” needs to be regarded from the individual learner’s point of view, according to William Scott (2010). In other words, we have to consider *what* the learners really leave the activity with (Rauch & Steiner 2006, Brunold 2005, Hartmeyer 2001).

The project Lund Calling was initiated in 2008 by a Swedish municipal department of education, in cooperation with a university outreach initiative. The municipality had chosen to let secondary¹ schools participate in the Young Masters Programme (YMP), to implement ESD in a global–local setting. Within the frame of this project, educationally critical aspects in learning Sustainable Development (SD) with a global focus were investigated from the point of view of the individual, in an earlier report (Nordén & Anderberg 2010). The process of initiating practical activities to support learning for SD in global settings was also highlighted in the study. The YMP is an example of the so-called “third mission” in higher education in Sweden (Booth et al. 2007). The programme consists of an adapted version of what was originally a transdisciplinary Masters programme on SD at university level. The YMP is offered online for secondary school pupils only, without cost. Since the start in 1999, 10,000 participants in 120 countries worldwide have connected, via global classrooms, to the still ongoing YMP (www.iiiee-ymp.org).

In the earlier report (Nordén & Anderberg 2010), the qualitative similarities and differences of experiences of participating headmasters, teachers and pupils were grouped into four “aspects”: (1) promotion of local commitment in global settings; (2) global–local interaction, which contained the two sub-aspects (1a) silent global classrooms and (1b) active global classrooms; (3) knowledge formation about teaching and GLSD in a global–local context, which consisted of the three sub-aspects (3a) towards pupil democracy, (3b) reflective learning, and (3c) pedagogically anchored teaching; and finally (4) the ability to act globally.

The aim of the present study is to closer investigate the fourth aspect, which is crucial in a global–local context, particularly in relation to the continuation of the GLSD process. In the following, the fundamental abilities needed to act globally will be referred to as “knowledge capabilities”, according to definitions made by John Bowden (2004), and John Bowden and Ference Marton (1998), presented below. Focus here lies on how important features in the development of those capabilities relate to the way the process of initiating the YMP was experienced among the participants.

Background

According to Andreas Otto Brunold (2005), the emergence of international concern for issues of SD increases the demand for GL, as well as education for SD. To shed light on what GL means in an ESD context, it is helpful to compare various interpretations, and analyse commonly used definitions from different fields. The following clarifications thereby provide a background for how “global learning” should be understood in this article, as well as connecting the notion to the research field of GLSD. With respect to the implementation of GLSD, Annette Scheunpflug and Barbara Asbrand (2006) highlight that global learning calls for a foundation and a theoretical frame that can be explicitly related to SD. Scott (2010) points out that “global learning” should be the result of educational programmes taking sustainability seriously. Additionally, to be meaningful, GL needs to relate to the individual learner’s process and learning outcome. In an attempt to establish some parameters, Scott suggests the following way of reasoning about GL:

‘Global learning’ if it is to be meaningful, it has to relate to educational/learning outcomes. This is one way of expressing this: The government wants all young people to be interested in and feel knowledgeable about sustainability, to be able to critically reflect on how they wish to live their lives, to understand how their own actions impact on other people, and to feel empowered to act on this awareness to work with others to create a more just and sustainable world. (Scott 2010)

The learners thus need to bring outcomes with them from “global learning” activity, including a set of capabilities that relate to the field in question. Elsie Anderberg, Birgitta Nordén and Birgit Hansson (2009) assume that learning about sustainability issues in a global–local setting is above all characterised by learning to manage uncertain knowledge concerning complexities. Links need to be established between everyday problems, global processes, and lines of conflict. Their assumptions in this respect are in line with the claims of Brunold (2005), Günther Gugel and Uli Jäger (1996), and Scheunpflug and Asbrand (2006). It is argued that the development of such capabilities is supported in learning contexts, where learners’ local experiences are incorporated as central aspects of the course. These experiences are exchanged, through dialogues within global settings, and progressively reformulated in the process of learning.

According to Franz Rauch and Regina Steiner (2006, p. 124), “learning aims at acquiring a reflective ability to shape the world”. This is quite different from uncritically adopting a previously defined

set of action patterns. They further suggest that SD and GL are related through reflective abilities, stressing pupils' self-development and self-determination through interaction in global classrooms with pupils in other countries, as well as with their local society. Rauch and Steiner bring up the exciting potential of communities of learners – teachers, pupils, and researchers – who were given the opportunity to reflect in collective settings, spotting interrelations and opportunities for action. This view on GLSD lies close to Nordén (2008), and Anderberg, Nordén and Hansson (2009), who also identify the need for extending the individual's knowledge capabilities to act, involving part-to-whole relationships between process and content.

GL *per se* cannot serve to create a better world, but encourages self-determination in a global context. It performs a critical function, with respect to creating interests and necessary experience (Rickinson 2001, Rauch & Steiner 2006). However, earlier tends to take for granted specific competencies, which individuals need to develop, in order to work for SD. These competencies include leadership skills (Olum 2004), such as team skills, readiness to compromise and to collaborate, coping with change, creative and lateral thinking, the ability to deal with insecurity, integrated thinking, and systemic thinking. The role of the teacher changes from being the expert, to “seeking out interesting real life problems and framing questions around personally discerned needs in collaboration with pupils” (p. 160). Per Sund and Per-Olof Wickman (2008) highlight that teacher and pupils need to work together in a team, define problems, as well as analyse and answer SD questions from a variety of scientific perspectives. In other words, a fundamentally transdisciplinary approach is required.

Improving teaching and learning in the field of ESD requires of the individual teacher, not only knowledge of the subject matter, but also an ability to adapt to various learning situations in a flexible way (Sund & Wickman 2008). Sustainable development is by Sund and Wickman (p. 160) identified within the international educational research field as *abilities* required for open-ended learning. Bjarne Bruun Jensen and Karsten Schnack (1994) emphasize the importance of using conflicting interests as a starting point for the development of *action competence*, thereby adding an essential learning outcome into their concept of ESD. A further step in this direction is the kind of youth action competence which is developed through informal learning, as Ellen Almers (2009) has highlighted in her research. Developing relevant skills, with competence to act globally, also presupposes a holistic approach to the relationships between knowledge, abilities and attitudes. Findings from the earlier study (Nordén & Anderberg 2010) indicate that the formation of knowledge, abilities and attitudes,

during the implementation process of a project for GLSD, depends very much on the extent to which *capabilities* are developed in the course of that process, and how they are related to the content focused in the particular learning setting. This type of fundamental knowledge capabilities differ from isolated, more specific abilities, and can not be developed in *over-simplified* problem-solving process situations. Relying on logic-deductive thinking (Sund & Wickman, p. 160), it is possible to consider capabilities as characterised by abduction (Hansson 2000, Peirce 1934) processes, allowing learners to deal with complex and entirely new situations. This has also been highlighted in earlier research in GLSD (Nordén & Anderberg 2011, Anderberg, Nordén & Hansson 2009, Booth et al. 2007, Hansson 2000, and Nordén 2008).

Knowledge capability theory

The knowledge capability theory derives from a pedagogical theory within the phenomenographic perspective on learning (Bowden & Marton 1998, Bowden 2004), in which individuals are learning for an unknown future. The notion of “knowledge capabilities” as learning goals thereby emerges as a central idea – that is, capabilities to act in new situations. It is argued that pupils are “learning through interaction with current knowledge, so as to become capable” of dealing with situations in the future.

... [the] ability to handle previously unseen, real-life situations, to make sense of them, to figure out what the relevant aspects are, to relate them to what you know and to find out what you don't know but need to use ... to define the problem and only then solve it, is what I have termed knowledge capability. (Bowden 2004, p. 40)

The precise characteristics of these future situations can not be specified in advance, regardless of whether they pertain to professional, personal, or social contexts. According to the knowledge capability theory, learning cannot be defined in terms of educational inputs, but rather in terms of expected and achieved outcomes. This aspect remains in line with the competency movement (Bowden & Marton 1998). Education is about the future, not the present, according to Bowden and Marton (1998), and they emphasize that it is not appropriate to describe outcomes based on what professionals are believed to be capable of doing right now. Capability can therefore not be specified simply in terms of what a person can do, they argue. Since pupils in their future professional lives will be facing a great variation of circumstances, effective and appropriate actions will vary from situation to situation. Above all, pupils need to learn how to focus on critical aspects of professional situations, i.e. they

must understand how to simultaneously see – discern – and attend to relevant aspects of a particular situation. Having the capability of focusing a set of critical aspects in a particular learning situation, provides

... a far more holistic capability than those commonly defined in competency-based approaches. Moreover, such holistic capabilities represent the links between disciplinary knowledge and professional skills. They are the transformation of the eyes through which the professional world is seen. (Bowden & Marton 1998, p. 12)

Knowledge capability, according to Bowden (2004, p. 40), is characterized by being able

1. to work out what are the key aspects to be dealt with in each new situation
2. to relate those aspects to the knowledge already acquired and/or to knowledge the graduate knows how to access;
3. to determine what the underlying task or problem in that situation might be;
4. to design a process or solution to deal with the situation; and then
5. to have the ability to follow through and complete the task or solve the problem, either alone or with others.

Booth and Anderberg (2005) use this theory when describing teachers' experience, in terms of teaching knowledge capabilities when participating in educational courses at an institute of technology. The aim was to develop clearer principles for the design of programmes of educational development, helping university teachers to become developers of their own practices.

Choosing knowledge capability theory as a point of departure, the expression "ability" which was used in the previous study (Nordén & Anderberg 2010) will here be substituted by "knowledge capability". In the present research, our aim is to make use of this theory as an underlying framework, when investigating the data more closely.

Method

The earlier study

In the earlier study reported by Nordén and Anderberg (2010), the background of the process of implementation in the municipality of Lund was presented in detail, as well the YMP course and the design of the study itself. The interview guides were described in Appendices

1–8, pp. 47–54. Data was collected from 2008 to 2009. Pupils (13–19 years old), teachers, and headmasters were interviewed, coming from a total of six different compulsory and upper secondary schools. The number of informants was 15. A total of 20 interviews were carried out, and later fully transcribed. Some of the informants were interviewed at the start and in the middle of the YMP course, while 2 teachers and 4 pupils from upper secondary schools were interviewed after their participation, as well as 2 headmasters (one from a compulsory school, and the other in charge of an upper secondary school). Retrospective interviews were also made with upper secondary teachers and pupils who participated in the YMP a preceding year.

Analysis of the fourth aspect: examples of critical knowledge capabilities to act globally

A number of changes in the regular school activities took place in connection with the initiating of the implementation of the Lund Calling project. Some of the changes experienced by the pupils, teachers, and headmasters gave rise to educational development, while other changes were not experienced as educationally productive. In the present study, the answers from the semi-structured interviews were analysed with respect to this issue also using a phenomenographic approach (Marton 1981, Svensson 2004). Changes that were experienced by the respondents in the study as contributing to improved learning and various forms of educational development were distinguished from changes that did not lead to such development. These experiences were then related to knowledge capabilities which participants felt had been developed in the programme, respectively considered necessary to support GLSD, but which were insufficiently developed in the programme. Examples of knowledge capabilities were thus grounded in pupils', teachers' and headmasters' experiences. Experiences of changes were grouped into two parts in the results (I and II), as seen below. Pupils' experiences dominate in the results, since the number of interviewed pupils was larger ($n=8$), than the number of teachers ($n=5$) and headmasters ($n=2$), respectively. The headmasters' contributions are valuable, however, since they provided a wider perspective, both on the organisational conditions of the implementation, and concerning the educational development it involved.

- I. Experiences of changes identified by participants as giving rise to educational development supporting GLSD, related to examples of critical knowledge capabilities developed through the programme.

II. Experiences of changes that did not lead to educational development supporting GLSD, related to examples of critical knowledge capabilities felt to be necessary.

The presentation of the results is in those two parts. Each part begins with descriptions of changes that gave rise to and that did not favour educational development, followed by examples of critical knowledge capabilities related to these changes.

Results

I. Experiences of changes identified as giving rise to educational development supporting GLSD, related to examples of critical knowledge capabilities developed

a) Changes that gave rise to educational development

Pupils experienced that the arrangement of the YMP offered “global classrooms”, making the YMP content accessible globally online. Developing contacts with pupils from so many countries was considered as having great value, and experienced as important.

you get contact with the surrounding world, and know what it is like there and their opinions. [pupil, secondary school]

According to one headmaster, the meaning of the term “sustainable development” assumed a different significance in the course of the implementation. From only having been a politically correct term, the headmaster experienced that the meaning of ESD shifted, and actually became a matter of how to be better prepared for the future. Then, the question was no longer *if*, but rather *how* this task could be accomplished at school. It had become obvious, according to the headmaster, that there was no choice – this is the core of what the teachers and the headmaster at school have to work for.

I have learned quite a lot on the journey getting here, of course, from sustainable development being more sort of a politically correct notion /.../ I have probably come to realise that the core of our mission is likely working with sustainable development, and then I also got it described as it is actually all about working with our future. So it is not sort of a question of if?, but it is a question of how? we shall work with it. [headmaster, secondary school]

./.../ of course, it is a question of pupil influence, about being able to work across disciplinary borders in a collaboration, and also about dealing with questions around and about the environment, both in a practical sense, and how do you deal with all the situations of conflict that you have to define your standpoint towards as a child or young person today, that is, via media: what is happening in the world? In small matters as well as large ones, that is contradictory facts and facts that change over time. [headmaster, secondary school]

The local politicians and national school steering documents had assigned the task of teaching SD to the schools in the format of a quality assurance task. The school employees, i.e. the teachers and the headmaster, work under a “SD-umbrella”. This not only includes thoughts about learning for SD or relating to particular environmental aspects of SD, but is very much a matter of pupils’ influence, transdisciplinary collaboration within a cooperative framework, and learning to handle questions about environmental issues in real life.

./.../ the pupils get another way of working, because they need to learn that too, so that it is not just sustainable development, but it is also that they work sort of in this virtual classroom, that is also an experience, and getting feedback from others in other parts of the world. It is *./.../* an element of tension, just that, actually meeting people *./.../* to see the reality of others – others’ daily lives – that it is so different. [teacher, secondary school]

b) Examples of critical knowledge capabilities developed

To take command

Some of the pupils felt that they learned that they had to take command. They found out lots of things themselves, by seeking guidance in the learning instructions of the YMP, among themselves, and via Internet in general. Those pupils proved they had the competence to work more independently without the attendance of a teacher, and study on their own online. This is a form of critical knowledge capability that can also be interpreted as the responsibility taken by individual pupils, using a potential for competence building, through global learning activities relating to sustainable development. It seems that these pupils experienced the role of the teacher as a collaborating partner. By taking part in global activities during the YMP, the pupils developed their capacity to manage work independently.

It is just way more independent, you get to take many more initiatives yourself, and you get to develop your things on your own, and then you also see in a much more responsible way that this work has to be done, sort of. Then you feel that you yourself have to organise the way you work, instead of the teacher standing and telling you now this is what you have to do. [pupil, secondary school]

/.../ well I have learned a terrible amount, but in some way it feels like that it was a lot as part of myself, so to speak, because I was looking for the information and writing my papers and talking with my mates above all, we were the ones who exchanged ideas. [pupil, secondary school]

.../ well, I got a head start in some subjects [thanks to the YMP-course] and I have become better at dealing with debates, since I thereby knew more... [pupil, secondary school]

Those pupils experienced participation in the YMP as rewarding, through the specific knowledge and skills that they gained. These contributed to developing their knowledge capabilities to participate actively in discussions, to debate challenging issues pertaining to GLSD, thereby further advancing their knowledge formation.

Through self-determination and self-directed learning, the pupils gained learning advantages and could balance the absence of supervision. They found out the point of departure for his/her own role concerning some SD problem, and thereby gained knowledge about other similar or related dilemmas. This helped the learner to see and understand more holistically, and get an overview of SD challenges of a fundamentally transdisciplinary nature.

I learned a huge amount, absolutely /.../ before I wrote a module like I was told /.../ I found some information on the internet generally, and felt a bit where I stood in different issues and problems. So I feel that I learned quite a lot about problems that exist today. [pupil, upper secondary school]

One headmaster also experienced that some pupils developed the capability to work independently and take responsibility. Those pupils worked on their own with the learning content, since supervision time was limited. At the same time they developed the capability to cooperate with other pupils. A strength built into the YMP is the worldwide outreach, and the opportunity to get acquainted with a variety of perspectives, by meeting people from all parts of the world in global classrooms via the Internet.

.../ the way of working I think is good: you read and then you work, using your own local area as a point of departure, and then you have your room where you meet others who have done the same task, but in their own parts of the world. [headmaster, secondary school]

.../ the independence, that we get to work in groups on our own, and sort of write ourselves and submit .../ it is very exciting .../ the website, that there are loads of Chinese and .../ Dutch who are there with you so you can talk with them yourself .../ magnificent that there are really many. [pupil, secondary school]

.../ it is very much a matter of getting a functioning pupil influence, both on an informal and a formal basis, so that you can get both adults and pupils not just to learn about democracy and influence, but work with it all the time. Plus then being able to cooperate as much as possible. Between teachers and teachers and pupils, to reach so, actually something more than just basic knowledge, but some sort of what they describe as competence to act for the future. [headmaster, secondary school]

By making global classrooms available to pupils, they were able to develop knowledge capability for networking and communicating with pupils in different countries, as a part of their GLSD learning process. Those participants experienced that one of the foundations for SD was thereby made accessible, and recognised that a democratic GLSD knowledge capability process had been developed among the learners.

To collaborate a team

Some pupils understood that they themselves had to organise the way they managed the tasks, and initiate cooperation in small teams locally, while solving the numerous YMP tasks. They drew benefit from sharing the job, and from exchanging new ideas, so that they could reach original conclusions together. The critical knowledge capability, in this respect, was the ability to see that the complex content needed to be handled collaboratively. Experiencing this process resulted in the pupils themselves independently arranging for new alternative learning management strategies, and knowledge formation among themselves while networking:

.../ you could try out ideas on each other and reach good conclusions. [pupil, secondary school]

These pupils recognised that they had to develop, to be able to fully participate in a learning process which they largely defined themselves, but where the YMP content and the global classroom online were sup-

plied by the programme. Implementation links for team collaboration had not been provided by the platform. We may thus characterise this critical knowledge capability as consisting of the pupils' own initiative – once they had identified the need to organise cooperation themselves – to optimise their learning by making an agreement to plan and share work tasks between themselves. Through self-determination, each pupil in the small local team carried out tasks individually, and then sent it to the others to read and comment on. This was appreciated as a constructive way to support fellow pupils. Everyone in the team got indications about what they needed to reconsider within their learning activity, thanks to the others' feedback, and additional suggestions on what to submit further to the answer. Afterwards, the assignments were jointly published in the global classroom, on behalf of the three pupils of the team.

/.../ then we started with writing all the assignments together, but then we agreed that /.../ to do one task each, and then send it to the others, so they could read it through and have opinions..., which was a really much better way, because then you got to help your mates and you got to know yourself what you had to keep in mind. [pupil, secondary school]

Several teachers had the impression experienced that their pupils' language skills were in particular well developed, which was confirmed when they got feedback from pupils in another country.

/.../ well our pupils were really thrilled when they saw that they had got /.../ a comment on what they had achieved /.../ from South America /.../ they realised that the English of our pupils was far better, because it was pretty weak, theirs, that is, the response they got. So they were probably partly pleased that they had received attention, but they thought that the answer was rather lacking in substance. [teacher, secondary school]

II. Experiences of changes that did not lead to educational development supporting GLSD, related to examples of critical knowledge capabilities felt to be necessary

a) Changes that did not give rise to educational development

Many different kinds of changes occurred in the course of the YMP programme. However certain of the changes that were effected were experienced as not generating forms of educational development which would support GLSD.

Some pupils explained that compared to the sorts of interaction that they had experience of from various online fora and similar platforms, they found the interactivity in the YMP poorly developed, since it was hard to get attention online for new contributions. Pupils thought this was less satisfying. This appeared as a critical feature within the intended initial steps of the implementation, in connection with changes in educating for SD.

/.../ generally concerning the flow of information between us, pupils, and between teachers on this site. The point was that you should be able to talk with people, then, from other continents and different teachers, and exchange ideas and thought and things, but it felt that due to low activity, and due to difficult navigation on the webpage it was difficult to get to the occasions when you could talk about it. Because it felt like that was sort of the thought behind the whole project, but it felt like you did not get to take part of it as much as you would have liked to. So I suppose that was what I missed the most, to communicate. [pupil, secondary school]

The YMP content online was experienced as important, since it provided a common foundation for knowledge formation. At the same time, the learning process lacked interaction, and responses from other pupils, tutors, or mentors were not frequent enough. The global classroom (i.e. the platform online) did not generate focus on important aspects, or automatically support good communication. Whenever something happened in the global classroom, this was not visible for all the pupils. Unless they actively sought feedback, they would hardly recognise the occasional comments that they might have received.

Some teachers pointed out that the YMP content was not always sufficiently anchored in the pupils' individual knowledge formation. Instead, certain pupils just presented an answer rather hastily in the global classroom, without deeper reflection.

Of what quality are the learning competences in the YMP, when the teaching has to rely and depends mainly on the responsibility taken by the pupil him/herself? [teacher, secondary school]

... they had motivation. On the other hand, I would have liked to see them work maybe a bit deeper, and there they need more close contact, so that you actually meet /.../ and check what does the assignment involve, what are the opportunities? And it would be nice to have sort of more pupils there then, who can reason with each other and give each other support. [teacher, secondary school]

/.../ make it into a course led by a teacher, you have the material, but provide time for reflection and discussion and that you really read through what the pupils from other countries describe, and say yes, why is it like this and how do we think about it that you really can use it for global thinking in a totally different way than it is now, because now you answer dutifully, and you barely can summon the interest to read what you have answered. [teacher, secondary school]

Some teachers concluded that certain pupils chose a shortcut, and did not appear to prioritise going through the background material that was meant to be used in their learning process.

b) Examples of critical knowledge capabilities identified as needed

To be prepared

Some pupils expressed how some of the changes they experienced did not lead to educational development, in the sense of a common GL process. So, even though a global classroom had been designed for the pupils' studies, it was not functioning adequately. Common global learning processes had not been identified in advance. The critical knowledge capability needed in this respect, is that all the pupils must be well prepared, and have a clear idea of what is expected of them concerning collaboration activities.

/.../ well you were supposed to provide feedback to others on this webpage also, but it didn't feel like everyone was equally serious ... there were only a couple who gave feedback ... And we tried providing feedback to others also, but it had to be as much as we had time for. [pupil, secondary school]

One pupil explained that the lack of communication was what that pupil missed most in the online platform that was used. A general readiness for education of the kind needed in GLSD was also lacking.

/.../ we browsed around quite a lot and there were not a lot of groups at all who had done all the assignments ... it's a pity, because of course you wanted to read what the others had written, but then there was nothing to read. [pupil, secondary school]

Pupils expected feedback on their assignments. They wanted to read comments written specifically for them, but found nothing to read. They had been looking forward to meeting online with other pupils and teachers, to discuss and chat, but online discussions did not take place to the extent that the pupils had anticipated. Response is needed

from other pupils, tutors, or mentors; otherwise there is no scope for pupils to interact. This was not only caused by the platform's design, however. The problem partly arose from the time lag between the various groups working with each particular assignment on the YMP, meaning that groups were not focused on the same topics at the same time, or during the same period. Different starting dates and an individual pace of progression reduced opportunities for mutual feedback.

Another problem which was commented on was that the local teachers did not provide clear and detailed information, before or during the initial steps of the course. The teachers had not introduced the YMP in a confident manner, since they did not appear to know themselves what expectations they would be facing. Teachers were also unsure about how their own professional role was engaged, in relation to the YMP.

Both pupils and teachers identified a need for initiative, with respect to planning, arranging and getting meetings to function.

/.../ it would have been good both on a spontaneous level and a more well so to speak that you have planned it, and it would be great if the teachers knew about it and that they would write when a meeting takes place, and what one will be speaking about there and that you are very welcome to come and join it. But also that pupils who feel that they are maybe writing about a certain module and feel that they want to exchange a word or two with others who maybe can write on some forum that "well, those who want to talk with me at this time are very welcome to come in, because I would need a bit of feedback on this subject" or "I don't really know what I am going to write or what their point is". [pupil, secondary school]

The teachers further needed the competence to show pupils how to navigate on the web site of the online course. One of the pupils complained that it was almost impossible to find the actual global classroom that the pupil belonged to, and wanted to access. It could take up to 15 minutes to identify its location, which was not satisfactory. According to one pupil, the web site design was especially something which the YMP providers had to improve for the future.

/.../ the links, actually. I didn't even know they existed. So it was probably mainly on my own, well really I feel that the website that YMP had was extremely difficult to navigate in ... I was unable to find them or know that they existed, since it was difficult to find. If you wanted to enter a particular classroom you sometimes had to click around for fifteen minutes before you found it, it was sort of really difficult. [pupil, secondary school]

To act in a transdisciplinary manner

Some teachers experienced that they were challenged locally during different stages of the course. Due to a lack of transdisciplinary knowledge capabilities, many teachers had to rely on some colleague, who normally would be teaching other subjects. They needed colleagues to be supportive and give “guest lectures” to pupils participating in the YMP. For example, economic issues were not well grasped by some teachers, who instead had disciplinary competence in subjects such as Biology, Ecology, Civics and Social Science, IT, or English. The ability to work in a transdisciplinary manner was thus identified as a critical capability by teachers.

Distribute teaching hours so that a teacher of social sciences and a teacher of natural sciences who share the course /.../ sort of take turns supervising and that you then see with different eyes /.../ well it opens endless opportunities to help the pupils see that there are many different sides to the same problem. [teacher, secondary school]

/.../ the programme is /.../ very transdisciplinary /.../ So actually it shouldn't be teachers of natural sciences in there exclusively, but it should be a couple of different teachers in this project /.../ so that it gets really really good, because then you get all the perspectives. [headmaster, secondary school]

To lead for holistic understanding

Among both headmasters and teachers, it was felt that the “frameworks for all of us to work it out together”, must be recognised and developed. Headmasters require the capability to support teachers in locally developing the education which is provided.

/.../ there are loads of pedagogues and pupils who are aware of the importance of sustainable development and have understanding, that is not the problem. Instead, the problem is “so how do we work together with it, within the frame of the school?” And I can feel that at this school, people do not have a clear idea how to go about that, the question has not been critically examined. [headmaster, secondary school]

A critical capability for anyone, as a headmaster pointed out, is that you are expected to take a role as pedagogical leader in the school. For one of the headmasters, this means the ability to raise the crucial questions, such as seeing holistically when teaching, at various meetings, including the disciplinary subject matter conferences, as well as simply talking frequently with teachers to stress that this is a central issue.

A further critical capability identified as necessary for headmasters, is to prepare the teachers for the big overarching questions of SD. According to one headmaster, it is important to avoid drawing too heavily upon the contradicting opinions among the individual teachers. Rather, one has to weave together the understanding of a sort of training competence, with perspectives from different disciplines, and the subject matter knowledge which is actually needed. Nobody questions that these disciplines – in connection with the skills that each of them represent, seen from the point of view of various subject matters – have to be handled in a transdisciplinary manner. Finding ways to conduct the work at school, and lead the initiating steps towards an implementation in this direction, is a challenge. Nevertheless, choosing varying ways to accomplish this offers a great deal of rewarding opportunities, according to one headmaster. Despite the challenges involved, this headmaster stressed that it was feasible for a headmaster to lead the school towards more holistic understanding.

Discussion

In this investigation, certain examples of knowledge capabilities were identified by participants as critical for GLSD. These capabilities need to be acquired and developed locally, to support the type of learning required in the field. Some of the critical knowledge capabilities had been experienced as developed in the course of the YMP, while others were felt to be lacking. Brunold (2005) contends that global learning requires new values, giving up the aim of reaching the “right” or the “most appropriate” answer, based on a logical interpretation of natural balance. The character of knowledge has changed over recent years, which makes it increasingly problematic to seek to “accumulate” knowledge additively. On the road map towards GLSD, this central aspect is also pointed out by Hansson (2000), linked to a change towards working on developing “knowledge to act”, instead of viewing “knowledge as possession”.

David Kronlid (2009) claims in his educational research that “learning takes place in spaces of capabilities, in expanded spaces of beings and doings” (Kronlid 2009, p. 34). According to Kronlid, that means in different concrete ways, shared global problems systematically improve learning conditions, when the learners’ spaces for developing capabilities are enriched.

Critical knowledge capabilities

According to the theory of knowledge capabilities (Bowden & Marton 1998, Bowden 2004, Booth & Anderberg 2005), the criteria presented by Bowden (p. 40) as number 1) “to work out what are the key aspects

to be dealt with in each new situation” and number 5) “to have the ability to follow through and complete the task or solve the problem, either alone or with others”, have been of particular interest in this investigation. The critical knowledge capabilities described in the results are to be seen as examples of these two criteria. Results can also be compared with Hansson (2000): “Peirce and Bateson stress the relationship between theory and practice, combining holism, relationship and perception” (p. 143). *Abduction* was for Charles Peirce (1934) important in develop understanding of complexities, and the concept could be used as the logical basis for relational thinking, and for a holistic way of reasoning. Through an abductive activity, the awareness of the complexity of the world around us is maintained, and the opportunity for deeper understanding might increase. Knowledge is to be judged for its purpose in relation to action, according to Peirce. Through a process of verification, what is believable and what is to be rejected could be decided, while avoiding over-simplification and maintaining complexity. The pupils very often lack the ability to make a deductive step, or to test an idea through abduction. This could be remediated by introducing pupils to more qualified ways of reasoning in collaborative settings (Bateson 1972, Hansson 2000, 2004, Hansson & Nordén 2005, Sund & Wickman 2008, Hansson 2000). Meetings and discussions with teachers are important occasions for learning the deductive step, according to Noel Gough (1987).

Knowledge capability development enhances democratic action

The findings of the present study have been developed on the basis of the theory of knowledge capabilities and shows the meaning of knowledge capabilities for GL, in relation to a global–local context. These can be compared to the findings of Finn Mogensen & Karsten Schnack (2010), who discuss the expanding use of the notion of “competence”, referring to new (and potentially useful) critical–constructive educational conceptions of the “action competence” approach. This has also been central in the study by Almers (2009). Depending on teachers’ action competence, ESD could turn out to be a pluralistic activity (Öhman & Östman 2008), enhancing the outcome of students’ awareness and ability to interact with others holding diverse standpoints.

The role of democracy in education and sustainable development has been analysed by Johan Öhman (2008) and Leif Östman (2003). For democracy to function, young people should feel that they are heard, whenever they contribute to society in a respectful way, as citizens

(Östman 2003). By being confirmed at school – and in society – young people can see themselves as a part of the common efforts towards sustainability (SOU 2004, Öhman 2008). In view of changing conditions which impact any efforts towards sustainability, also globally, democratic skills can be considered as a form of “action competence” for SD, including actions on both an individual and a structural level. At the same time, we observe the need for tools, to reach a deeper knowledge formation process, and to grasp the complexity of sustainability issues, in a global learning space. Several of the critical knowledge capabilities found in this investigation can also to some extent be regarded as democratic skills, particularly “to take command” and “to collaborate in team”. Understanding collaboratively is a form of learning that evolves in a *process perspective*. Additionally, this creates the foundation for well-developed competence to *act democratically*. With GLSD, both necessary skills and a deeper understanding of the content could be gained locally, via GL activities in global–local settings.

One of the critical knowledge capabilities described as needed was “to act in a transdisciplinary manner”. There are several benefits to transdisciplinary approaches, according to Björn Vikström (2009). Transdisciplinary knowledge formation takes place *in* society. It does not have the intention of being produced *for* society, but develops in collaboration with the actors who are involved in whatever sphere is being investigated (Almers 2009). Transdisciplinary research is also conducted when there is interaction between science and other fields of society (Bruun et al. 2005). This means that the individual actors in society are included as a part of the process, and the research is contextualised. In fact, the YMP initiative is characterised more by the perceived needs of society, than by academic competences which are typical of the university (Booth et al. 2007). In this perspective, the researcher does not occupy the position of an “expert” who proposes solutions, but rather functions as a participant, sharing experiences with the actors involved in the transdisciplinary research process (Hillbur 2004, Vikström 2009). There is a reason for stepping outside the disciplines – and not getting stuck in approaches that are merely multidisciplinary or interdisciplinary – in particular when researching and working with sustainability issues. Rather than maintaining the perspectives of individual disciplines as a point of departure, the centre of attention instead is placed in the problems that we strive to solve. Various perspectives, the perception of the problem, as well as possible solutions, all change and develop in the process of investigation. The approach which was adopted when designing the YMP was shaped by the vision of bringing secondary school pupils into the presence of authentic disciplinary practices, in order to broaden the reach of

research on SD from university, and bring it out to society (Booth et al. 2007). According to Vikström (2009, p. 6), when focusing on how to apply transdisciplinary research in practice, close exchange with the actors concerned by the research results is desirable, though not an absolute condition.

Teacher teamwork has the potential of supplying transdisciplinary knowledge formation locally, since despite their aspirations, teachers frequently experience that they do not individually have full capability to cover the knowledge field of SD. Teachers from a variety of disciplines, teaching different subject matter, might collaborate as professional teacher teams locally. Collaboration could allow them to collectively attain a kind of transdisciplinary capability, as supplementary steps to promote GLSD. A transdisciplinary approach when teaching subject matter of various disciplines would further add to developing a holistic perspective in SD knowledge formation. Above all, it could lay the foundation for an interest in advancing a form of competence to act.

Further research is recommended, concerning the teachers' role, their thinking and ways to support pupils' learning in connection with GLSD. This involves the question of how to conduct and implement more self-directed learning in a global-local context. Also, more knowledge is needed concerning the challenges of handling transdisciplinary teaching, and the specific capabilities teachers require, to meet these new complex fields of learning.

Note

1. Secondary schools include both compulsory schools and upper secondary schools in this study.

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