

# Global Knowledge Formation in the Extended Classroom: Transdisciplinary Network for Global Learning Towards Sustainability

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## **Abstract**

The Young Masters Programme (YMP) is an online programme about sustainable development and preventive environmental management strategies that has reached out to some 20,000 students in 110 countries since 1999. Young people from different countries work interactively with a common content and learn by a global exchange of ideas. Students use transdisciplinary approaches to investigate various sustainability dimensions of their daily lives. The study adopts a phenomenographic approach to analyze and describe the ways in which these students have experienced their learning process in the field of sustainable development within the YMP. The meeting between the course content, the intercultural discussions and the students' own life-experiences constitute a context for knowledge formation emphasized by the extended classroom in the YMP course. The context of learning is interesting in the diverse situations that distance learners are in and the diversity that the course itself incorporates. The data consist of the students' assignments and follow-up discussions with their reflection on global networking and a questionnaire about their learning process. Findings showed the value in global knowledge formation. Students had different conceptions of apparently similar concepts, and deepened their knowledge through reflection on such differences. Meetings with varying content and different perspectives encouraged the students to reflect further on attitudes and actions affecting the environment. The students met one another as representatives of different cultures with different assumptions and values, living in a common world, and could problematize common issues concerning sustainable development.

## **Keywords**

Knowledge formation contexts, global learner's perspective, sustainability, transdisciplinary networked learning, phenomenography.

## **1 Introduction**

The Young Masters Programme (YMP) online about sustainable development and preventative environmental management strategies has reached out to some 20,000 students in 110 countries since 1999, when the International Institute for Industrial Environmental Economics (IIIEE) at Lund University started this course for young students in the age group 14–18 years (Norden, 2005a; Norden 2005b). Young people from different countries and cultures work interactively in an extended classroom with a common content, using a problem-oriented approach (Hansson and Norden, 2005). The YMP course is free of charge and supervision is provided.

The teenagers work in interactions across the globe to learn about sustainable development through exploring a learning environment with ICT-mediated ways of communication, providing global interaction with ideas and descriptions, and a transdisciplinary approach focusing on social, economic and environmental dimensions of the students' daily lives (Laurillard, 2002; Norden, 2006). These global meetings seem to particularly catalyze

participants' commitment for – and their learning process in – a more sustainable direction (Nordén, 2005b). The programme has demonstrated the pedagogical value of linking distant partners internationally, allowing them to take part in a set of information sharing, awareness raising and knowledge formation activities concerning sustainability issues (Hansson and Nordén, 2005).

The present study was part of the research project Learning in the Extended University (LiEU), conducted at Lund University in Sweden. LiEU focused on the meaning affordances offered ICT-supported outreach initiatives involving flexibility and diversity, how meaning was constituted in these learning environments and how participants experienced meaning. The overarching aim of LiEU was to describe and analyze learning in three distinctly different outreach initiatives and consider the implications of the results for ongoing development and future design. The project was awarded funding by the Committee for Educational Science of the Swedish Research Council during 2004-2006.

## **2 Background**

### ***2.1 Basic conditions for knowledge formation***

Learning takes place not only at school. It takes place in different contexts and in an “extended room”. Generally speaking, there is an overall context in which the students form their knowledge, and any knowledge area can be perceived as both close and distant for the students. In their total surrounding world they have to connect theory and practice, and a simplistic presentation of scientific principles could make it impossible for them to understand the theory behind the practice.

Individuals not only try to form knowledge in different areas, but they appreciate this knowledge for different purposes. Through their knowledge concerning sustainability issues, for instance, students may anticipate what will happen, or they may understand why things work as they do. Knowledge is also an essential basis for both values and action. To the extent that adequate and relevant knowledge is missing, there is a risk that decisions about sustainable development issues will be based on unfounded opinions (Hansson, 2000; Hansson, 2004).

According to Peirce (1934) knowledge is to be judged for its purpose in relation to action. It is important to confirm the new meaning in relation to earlier knowledge. Through confirmation it will be decided what is believable and what is to be rejected. Peirce uses the concept ‘abduction’ as the logical basis for relational thinking and for holism. Through an abductive operation of thinking, the complexity can become clearer in our awareness of the world around us, and opportunities for deeper understanding will increase.

Abduction is important in finding the qualitative characteristics in a phenomenon and provides a way to understand complexity. Students very often lack the deductive step, but this problem could be addressed at school through more reasoning forms of discussion during the lessons. Meetings and discussions with teachers can provide valuable opportunities students to refine their deductive reasoning, by offering immediate feedback, adapted information or guidance concerning key points. Different conceptions and different ways of understanding what are apparently similar concepts have to become the object of reflection, and this gives

rise to knowledge formation (Pierce, 1934; Bateson, 1972; Gough, 1987; Hansson, 2000; Hansson, 2004).

## ***2.2 Knowledge for sustainable development***

The content and perspectives of environmental education has gone through different phases over the past decades. The earlier concept "nature conservation" was first replaced by the notion of "environmental protection", where people were supposed to take care of the environment as a whole. Objectives have subsequently shifted in forming environmental knowledge for "sustainable development". In this perspective, the students were intended to be ready to act and work for changes and solutions of conflicts of interests. The shift in focus required development and restructuring of knowledge for sustainable development in concrete applications, where much of the initial driving force came from Agenda 21 management at international and national level.

Reflection on education for sustainability developed further in the following years. Wals and Jickling (2002) point out the chance to enhance the quality of learning processes in connection to the contextualization of 'sustainability' as it offers an opportunity for reflection on the mission of universities and colleges. Because the concept 'sustainability' is so complex and open to different interpretations (involving ethical, moral, aesthetic, and spiritual issues, as well as technical, economic, social and cultural questions), focusing on sustainability issues provides new ways of thinking. This brings academics into a new set of worlds, with other experiential, epistemic, and systemic implications – as well as entailing whole new worlds of learning and researching. As underlined also by Hansson (2000), educators with concerns about the future of the earth, seek more, not less diversity of thoughts, to find ways to deal with the complexities of relationships between human societies and the environment.

Sustainability talk brings together different actors in society, searching for a common language to discuss environmental issues. The process is about seeking rather than setting standards for education for sustainable development. Above all, this means creation of space – space for alternative paths of development. When different ways of experiencing the world meet, dissonance is created and "learning on the edge" is likely to take place. The fact that the concept 'sustainability' is unclear, provides colleges and universities an opportunity to confront their core values, well established pedagogies, students' learning, and relationship with the whole community (Wals and Jickling, 2002; Nordén, 2005b).

*//...society and environmental teaching team is to take these ideas of transdisciplinary approaches to solving real problems and explore what they may look like in a primary/middle classroom (Paige, Lloyd & Chartres, 2008, p. 24).*

Pathways towards sustainability education could be promoted by the increasingly recognized relationships between sustainability and transdisciplinary education, research and thinking (Scheunpflug and Asbrand, 2006; Paige, Lloyd and Chartres, 2008; Yueh and Barker, 2011). Learning about sustainability should also ultimately include discussions of alternative worldviews, ethics, and the role of humans within ecosystem (Moore, 2005).

Today, learning for sustainability has further diversified, and comprises numerous perspectives, such as ethics, global education, democratic responsibility, pluralistic approach, global learning, transformative learning, sustainability citizenship etc (Öhman, 2008; Anderberg, Nordén & Hansson, 2009; Tilbury, 2010).

### ***2.3 The extended classroom***

To combat poverty, war and environmental degradation, our systems of education face the challenge of finding sustainable ways to equip people all around the world with the skills and conceptual resources they need. . Distance education in the form of online learning is perhaps the most powerful means of extending this resource to make this accessible to humans globally (Nordén, 2006).

#### ***Online learning***

There are many definitions of online learning reflecting the flexibility and diversity of the practice and associated information and communication technologies. Related terms include e-learning, internet-based, web-based or networked learning. This paper will use Ally's (2004) definition of online learning as "the use of the Internet to access learning materials: to interact with the content, instructor, and other learners, and to obtain support during the learning process, in order to acquire knowledge, to construct personal meaning, and to grow from the learning experience" (p. 5).

Laurillard's (2002) analysis concerns both the complexity of knowledge formation and the question of how to conceive the ICT-mediated university. To make student learning possible, teaching should be designed so the learning is 'situated' in the 'domain of the objective', and the activities must match this domain. Further elements that need to be considered are how to engage the learner's experience of the world, and how to stimulate reflection on the experience, to produce the intended learning outcomes. It is not enough with the learner's personal first order experience. Every subject offers a different way of thinking. It is challenging to help students go beyond their own experiences, to use and reflect upon the subject, and thereby change their perspectives and the way they experience the world. That is the reason why education must act at the second-order level of reflecting on experience (Laurillard, 2002).

From the perspective of student-centered education, it is of interest to find out what actually goes on when a student is learning online. Another fundamental question is how different learning activities may affect learning processes. A number of basic aspects of learning – as an integrative whole – provide a conceptual framework to make discussions about learning more manageable. These include: apprehending structure, integrating parts, acting on world (of descriptions), using feedback, and reflecting on goals-action-feedback. There is no logical order in how these aspects interact and function as parts of the process. Each part is constituted in its relation to the other parts, given the integrative nature of learning processes, and considering the inseparability of knowledge and action, process and outcome (Laurillard, 2002).

#### ***The YMP course***

Different studies conducted on the Young Masters Programme suggest that it has had a strong impact on participating students, both as individuals and as members of local and global society (Nordén, 2005a; Nordén, 2005b).The introductory parts provide participants with basic knowledge about sustainability and sustainable solutions (Nordén & Hansson, 2006a). Students and teachers from different parts of the world meet virtually in the asynchronic Forum discussions, synchronic chat and through quick messages or via e-mail within the course site to exchange ideas about environmental, economic and social challenges and

possible solutions. The students participate together with their teachers or mentors, who act as tutors and facilitators for the various learning activities. For optimal support during the YMP course online, the students preferably have a team of teachers and mentors of different subjects at each school working across the disciplines, facilitating for each local study group (the so-called 'delegations').

The participants of each delegation receive the learning material through the Internet and on a CD. The CD contains photo and film presentations and detailed information about how to interact in virtual course rooms to optimize the learning process. There are different learning activities, including presentations and discussions in the YMP online, which covers the first two parts. The content of these is also available via CD.

The YMP course online consists of two parts. Part 1 comprises eight modules of studies about sustainability. The students learn about biodiversity, gaining an understanding of the complexity of ecosystems and their natural balance, as well as social, economic and environmental challenges. They begin looking at their world from the perspective of sustainable development. By learning about Agenda 21, they join international efforts in planning improvements and will be able to take a stand on sustainability issues. Part 2 focuses on sustainable solutions and deals with preventive environmental strategies over ten modules. The participants find out how various actors in society are linked together, taking into consideration the role of consumers, design for environment and product development, construction, as well as the total life cycle of a product, in order to address sustainable development. They learn to go to the source, instead of focusing end-of-pipe solutions.

An optional Part 3 can be added where the students apply the concepts they have been learning about to real situations in their local surroundings in a project. This also serves as a preparation for Part 4 participation for the students, who initially only communicated with each other via Internet. During the final part, students could meet and discuss their projects and experiences face-to-face during the Global Environmental Youth Convention (GEYC), which is arranged every second year. The first Convention, GEYC 2000, took place in Lund, Sweden, and the two following conventions were in Turin, Italy, and Alexandria, Egypt, respectively. The GEYC 2006 took place in Dubai in the United Arab Emirates 9-13 December 2006, with the overarching theme "Peace and Sustainable Development".

#### *The context of learning; the extended classroom*

In the design of the Young Masters Programme, the students stay in a local room. There they get the information they need as a point of departure for forming knowledge. The local room functions as an inner room of an extended classroom. The local room is a prerequisite and a preparation before the students join the extended room. According to the aims of the YMP, each group is in contact with the local community where the students live, and carries out inquiries in its surroundings. The learning process includes theory as well as practice. The local groups study and have meetings in different places at their locality, such as their school, library, home, and even other places. Different localities offered different possibilities. After the group has studied the content of a module, a learning activity is proposed, and the group works with an assignment for the forum discussions. The local room also offers online learning. In this room the students' learning activities are summarized in different assignments, similar to local reports. The learning context is thus delimited in advance, but not narrowly defined.

The extended room includes the local rooms, but provides additional opportunities for learning. It is the main room because it provides a space where the experiences of learning of

the various participants can be expressed and reflected on. Each study group has published their assignments online, and everybody has had the opportunity to read and comment the assignments from other countries. In the extended room of the online platform, the students could compare, discuss, reflect and try out ideas for their knowledge formation. They experience less time constraints and fewer limitations for the learning activities, interaction and discussions, since there is a great flexibility within the framework of the YMP, allowing asynchronous interaction and different paces of progression through the modules (Nordén, 2005b; Nordén & Hansson, 2006b).

### **3 Purpose**

The purpose of the present study is to analyze and describe the ways in which students had experienced their learning process in the field of sustainable development within the ICT-mediated course YMP (Young Masters Programme), based on material collected in connection with the LiEU project.

Focus in the present analysis is in particular on the ways in which the meeting between the course content, the intercultural discussions and the students' own life-experiences constitute a context for knowledge formation, with emphasis on the extended room that offered by the course. The context of learning is particularly interesting in the diverse situations that distance learners are in and the diversity that the course itself incorporates.

### **4 Research design**

The aim of the analysis was to find qualitative differences in the experiences of knowledge formation. The study has been influenced by a phenomenographic approach (Marton, 1981, Marton & Booth, 1997; Marton, Hounsell & Entwistle, 1997; Booth & Hultén, 2003), where the goal is to capture the ways in which learning is experienced by the students, taking a second-order perspective on the object of study.

Twelve study groups form a team hosted in a virtual course room. Each of the virtual course rooms have a representation of different countries and different continents. In the present study delegations represented Argentina, Armenia, Belarus, China, Colombia, Cyprus, Egypt, Greece, Hungary, Indonesia, Mauritius, South Africa and Sweden.

The data have been collected from the students' assignments and follow-up discussions where they reflect on the assignments in the course's online meeting place. The three modules *What are the Environmental Challenges?*, *What are the Social Challenges?* and *What are the Economic Challenges?* were analyzed. Data was also collected and analyzed from the questionnaire on the students' learning process. All data are from Part 1 of the YMP online which took place during autumn 2005.

### **5 Results**

The urge to create meaning appeared to play an important role in the students' process of forming knowledge. How they form knowledge also depended on the context. Student

discussions and questionnaire data gave a picture of how students frame their reasoning within different contexts. The students are part of the local and of the global in the extended classroom. Scientific knowledge and references to students' knowledge of 'reality' appeared in the material as part of their learning context. Differences could be observed in different parts of the countries. Finally, it appeared that the young people participating in the YMP were offered opportunities to recognize others with the same problems, and that this was a key aspect of the course.

## **5.1 The students' voices**

### **5.1.1 Environmental aspects**

Today the way of life is seriously affected by economical growth and development of the cities. Today the concept of life is completely different and people living in urban environment believe in completely different values.

The students mentioned air and water pollution. Pollution from other countries is not just air and water. It could also be noise. The effect of pollution is different at different places. Eating fish and drinking water at some places could be dangerous for the health.

Many students mentioned that the urban society has negative effects. Noise pollution has increased, especially from traffic. Other negative phenomena mentioned included old technique, cars, buses, dumping of toxic waste. Some students mentioned tourism. Students expressed that tourism is not always good for places locally because it changes the landscape.

.. everything (*in the environment*) is interlinked together like in a food web!

Human beings take space from other living beings in the urban society.

The students wondered about how to find resources for energy. They think nuclear power stations save the forests, but the consequences of the accident in Chernobyl are not known for many people. Water as a resource is scarce and polluted. Biodiversity is decreasing. There is deforestation due to heating, farming, tourism and factories. These factories could be owned by other countries and the investors don't take care, the students emphasized.

Human beings have changed the environment to suit their life.

... all this is caused by man that is not conscious of all the damage that is causing.

Some students held the opinion that damage "needs a large amount of money" for repairing.

To build more water stations means to enjoy fresher air, cleaner water and bluer sky... it needs a large amount of money.

Environmental problem in (...) is used to leave out because of the other problems such as poverty, corruption and weak economy development.

Economic requirements triumphed over environmental considerations.

People are not aware about the environmental aspect. The students think people in general need to be more educated.

### 5.1.2 Social aspects

Unemployment is very often mentioned by the students.

Unemployment is a main cause for a chain of problems like poverty which leads to bad health conditions and increase of criminal rate in the society.

Poverty is also mentioned by many students. But it could be different at different places. The gap between rich and poor is increasing, they wrote. This is very obvious at tourist resorts. Some children are very poor, and lack of food prevents them from going to school. Economy raises many other problems.

Bad health is a social problem. The cause could be poverty. The students often mention diseases such as HIV/AIDS, but also welfare diseases.

Population growth, old population and family planning are recognized as the social aspects in sustainable development.

Drugs, alcoholic and family crisis could be linked and because of these problems some places have orphans. These are consequences of the others.

Terrorism, racism and ignoring of human rights are also considered by the students to be social problems.

There is lack of education or not so good education. Education could be offered, but is not always estimated by students in rich countries. Several young people don't like to study too hard. Sometimes young people are focused on themselves and don't take care of what happens around them.

Scarce resources and lack of energy cause difficulties for people in daily life:

The results (*of urbanisation*) are the creation of cities - mammoths, the desolation of countryside and economic decline.

### 5.1.3 Economic aspects

Poverty could be to have real problems to survive. It could also be to live under limited circumstances with low consumption.

...in the villages girls are not well educated; their parents prevent them from finishing their learning...

Unemployment is seen as an economic problem by many students. But education is not always a way out of unemployment.

Overpopulation is a big problem for several countries. The older part of the population will cost money for many countries, the students mean.

There are not enough money for education and health care in many countries. The diseases could depend on bad hygiene and lifestyle. With welfare and better economic situation for people, the students tell that cancer and heart problems occur.

The students see that internal conflicts and wars also consume resources.

A suggestion from a student is that fewer children, no wars and salaries from two parents will give a better economy.

## ***5.2 Sustainable development***

The students incorporated the themes below as parts of the field of sustainable development.

### *Poverty*

Environmental, social and economic aspects.

Poverty is a big problem in several countries.

### *Population*

Social and economic aspects.

Growing population could be a problem for sustain development. The demographic picture shows a big group of old people. That is an economic problem.

### *Unemployment*

Social and economic aspects.

Unemployment will give so many other problems.

### *Urbanisation*

Environmental and social aspects

The urban societies are growing. Thereby follows social and environmental problems.

### *Conflicts*

Social and economic aspects.

No respect of human rights, racism, internal conflicts and wars give social and economic problems.

### *Resources*

Environmental, social and economic aspects

Nature and healthy people are seen as resources.

### *Education*

Environmental, social and economic aspects.

## ***5.3 Transforming knowledge in the extended classroom***

When asked about what they had learned during the course, a wide range of perspectives and topics appeared in the questionnaires.

The most important things I've learnt aren't objective things, such as the ones you find in the forums, in the assignments we had to prepare. I think is more important having learnt that there actually are many people trying to save the environment, it's not only me.....I think that is the most important thing because it gives me hope. It's easy to find out what your country's HDI is, or what is the effect of global warming on earth, but the opinions of other people in the world, priceless and sincere opinions, are the most valuable thing....

During the course the students became aware of the big problems ”...*air pollution, sea pollution, poverty and uneducation*” in their own country. The complexity and the transdisciplinary approach of the ESD make the area quite difficult to understand. The students find nature, diversity and even ecology important as a knowledge background.

First we learned about nature, ecology and biodiversity.....Then we saw the environmental, social and economic problems in our country.

This has helped me a lot be more aware of the importance and the welfare of the organisms around me. I think it is good to know about the important roles they play. ...I was surprised to learn how a wide variety of species was crucial to the primordial existence of man on earth and how these factors are interlinked together and how it gives rise to a chain reaction.

Academic persons, scientists, experts are important and contribute to a platform for forming knowledge.

I think that it would be great if the experts told us more about their opinions, because they are the best orientated people about environmental problems. You know – our discussions- that’s one thing. But if we want to learn how does it really look like, we need to hear it from the experts.

To be aware of other countries is to be aware of your own country the students mentioned. There are exchanges of thoughts between the students.

It has also helped a lot while my delegation and I went to find information for particular activities. Moreover while discussing with other Young Masters from abroad has helped me develop a more critical and analytical mind. Hence I look around me with a different vision of things . Through debates online, I took into consideration the different beliefs of the students to make up my own conclusion. The exchange of how things are carried in my country and theirs, has acted like a catalyst in my reaction process. I realized that the problems we have to face, however different they are, they are all linked in one way or another to the fact of the abuse of our resources.

The students are learning about a certain country through the students living in that country. They read texts formulated by the young of same age. They reach information which otherwise is difficult to find. Somebody expresses that this is knowledge at non-political level.

The students are more frank and the people who live in the country maybe know it better than the experts, cause they live it in real, and give a different aspect from the experts who give the statistics. But Don’t Give the REAL Status of people and life. Still, the Experts’ research is very important, but I can know about researches from any where, the Internet or your library, but I can know about the people opinion ONLY from here in our Forum Discussions.

There was a huge exchange of cultures and the sharing of our different roots and country’s story.

That is more interesting to learning this way because you also interact with other people from other places of the world.....I have been influenced in all aspects: in feeling with many resources to help nature, wanting to go to other countries and meet cultures with their opinions.

They (other countries’ delegations) asking me and me asking them, helped me to see similarities and differences between our countries and thoughts.

The young people experienced how different they could see on the same issues. The cultural differences could be very evident. Through their own ways to express and to read contributions from other young people they could form and transform their knowledge.

They experienced that to learn from others can be a way to solve their own problems, but also to find out things they have not experienced themselves.

## **6 Discussion & Conclusions**

The young people took an active part in the extended classroom and showed engagement throughout the course. The students expressed that reading assignment content in a critical way and becoming aware of different interpretations had helped them in their learning processes. This material in the extended classroom appeared to be a great asset to students. The students become more aware of different aspects and ways of seeing problems, which they didn't think of before. They were conscious of people having different interpretations of the same phenomenon. But experts were also very important persons in the process of forming knowledge.

The students refer to two domains of knowledge in their online conversations: – "science-based" knowledge as well as "reality-based" knowledge. Being in two domains could be seen as beneficial for their understanding of phenomena which are important for sustainable development. But, the "reality-based" knowledge could of course be questioned – is it a contribution? This knowledge may not be believable?

The opinion held by the students as expressed in the online conversations, and when they were reflecting upon their shaped process for formation and transformation of knowledge, is that their "reality-based" knowledge *is* believable. Through new combinations different forms of knowledge is formed and become parts of new contexts of meaning. Thanks to the critical view – included in the collaboration, negotiations and exchange in the YMP students' discussions – a transforming learning process contributes to a solid foundation of a "reality-based" knowledge.

The processes of knowledge transformation for sustainable development occur in the diverse educational settings of the YMP. The extended room in the YMP online shows its value in linking distant partners internationally for information sharing, awareness raising and activities for knowledge formation. The varying meetings engaged the learners, in different processes of knowledge appropriation in relation to their social and cultural identities and interests. They started reflecting more on their attitudes, realizing how their own actions and the actions of other people affect the environment. The global meetings seemed to particularly catalyze the participants' learning processes, their knowledge transformation and their commitment in a more sustainable direction (cf. Nordén, 2005b).

Across individuals and communities knowledge is constantly shaped, reshaped and transformed according to different disciplinary settings. They become parts of new contexts through new combinations. The significance of this research is that the recognition of the YMP in the form of university outreach, to the students as individuals and as networked members of both the local and the global society, creates synergies aiming to be of future significance for a sustainable global development.

Thereby, hopefully this work can prove elements that help refine online teaching approaches, and understanding better the importance of the extended room for knowledge transformation in the area of sustainable development.

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