Nordic Innovation Networks in Education:
Dealing with Educational Challenges with Cross Borderer Collaboration and User Driven Design

Ulrika Lundh-Snis1, Ann Nilsson1, Lena Nilsson2, Lena Pareto1, Ann-Louise Petersen3, Sylvana Sofkova Hashemi3, Maria Spante1,4, Kurt Wicke3
1University West, Department of Economics and IT, Trollhättan, Sweden
2University West, Department of Nursing, Health and Culture, Trollhättan, Sweden
3University West, Department of Social and Behavioural Studies, Trollhättan, Sweden
4maria.spante@hv.se (Corresponding author)

Abstract

This is an EU-funded project related to cross border collaboration for educational purposes supported by information and communication technologies between Danish, Norwegian and Swedish schools. The project started in 2011 and extends to 2014 so this empirically dominated paper reports on early findings related to cross-border collaboration challenges. The aim of the project is to develop innovative cross-border teaching models by the means of user-driven, practice-based co-design processes between practitioners and researchers. In the first year, 18 classes from 13 schools in Denmark, Norway and Sweden in the Öresund-Kattegatt-Skagerack region participated. Organized in so called Nordic class-match groups (consisting of students and teachers from one class in each country) new cross-border teaching models are co-created, tested and evaluated in an iterative process. Since teaching models are subject dependent, the project develop teaching models in several subject domains, i.e. math, language, science and social studies/history. Heretofore findings show, however, that organizational and technical issues have superseded and squeezed out subject-oriented discussions due to surprisingly many practical issues that needed to be handled first. We have identified three major thresholds to overcome. The first is related to technical difficulties in schools when diverse IT systems are to be synchronized. The second threshold concerns scheduling coordination difficulties in order to allow synchronous cross borderer collaboration. The third threshold concerns linguistic and communication difficulties rooted in participants communicating in their respective Nordic language. Being able to communicate within Nordic languages are explicit learning goals in all three schools systems, and therefore part of the project aim and consequently all participants are expected to use their native languages when communicating. The next phase of the project is therefore to find solutions to these technical, organizational and linguistic barriers, and already now we see some barrier breaking models taking shape in the active network of Nordic teachers, students, school leaders, IT support teams and researchers.

Keywords: User driven design, cross borderer collaboration, network, innovation, education
Acknowledgement(s): The GNU project has received support from the European Regional Development Fund through the Interreg IVA Öresund-Kattegat-Skagerrak

1. Background and previous research

Schools in the Nordic countries have its strengths as well as weaknesses as all institutions have. However recently, in the three Nordic countries, there is an increasing concern regarding students’ achievements, particularly in mathematics, where Nordic students result is continuously falling behind compared to other countries (PISA). In spite of the criticism directed to the way mathematical skills are measured in the international ranking test, the result has attracted attention and created concerns about math education in Norway, Denmark and Sweden. There is also a vivid debate about reading comprehension and skills with declining results of Swedish students’ in reading achievement that raises for debate and development of teaching in this area (Skolverket, 2007; 2010).

Apart from this concern, there is also an increased awareness regarding the need for the general development of digital competence among students as well as teachers. In Sweden for example, digital competence has been acknowledged as one of the major competence areas for schools to develop for all students alongside with reading, writing, counting and democratic competence (Skolverket, 2011).

Still, the background of the project to emerge is not only linked to problems and concerns, it is also linked to the idea of collaborative learning. Nordic curriculum share similarities in some subject areas such as math, history and science for example, thus creating structural possibilities for cross boarder collaboration without major adjustment to each other’s everyday practice regarding content in the real learning situation in class. This way forward towards cross boarder collaboration in educational practice has been seen as one of the major shifts that will permeate educational institutions in the near future (Lee 2012).

Furthermore, major drivers for the project called “gränsoverskridande nordisk undervisning, GNU” [cross boarder Nordic education], has been societal development towards increased digitalization where being connected to each other via various systems and services online, and increasingly so with mobile devices, has become an essential part of modern life (Wellman, Salaff, Dimitrova, Garton, Gulia and Haythornthwaite 1996; Wiberg 2005; Boase, Horrigan, Wellman and Rainie 2006; Ling 2008) and identified educational challenges and possibilities in the Nordic countries briefly presented above. In order to find new ways of dealing with such challenges a range of actors, such as teachers, students, IT support team, principals and researchers from the three Nordic countries, has come together in a mutual effort to deal with the issue of creating new models for learning based on cross boarder collaboration in the educational sector.

In general, innovation is seen as a dynamic process rather than an isolated event. Actors at different levels in society, linked together in invisible but still real webs of connections, creates both possibilities and constraints for dynamic action in order to create development and progress, particularly studied with regard to economic growth of nations, regions and firms (see for example Edquist och McKelvey 2000). One of the key ideas in this type of research in evolutionary economics is a closer look at how actors access, develop and use knowledge and technology (Dosi 1988). These ideas about actors connected in networks for progress and development is one point of theoretical departure
from previous research that has influenced the following study.

As mentioned above, when it comes to the use of digital tools for social interaction, we can see how cross border collaboration in education necessitates the use of information systems and services when students and teachers are working together over nation boarders. Thus, social interaction to support learning becomes also linked to how actors access, develop and use both knowledge and technology, as enhanced by Dosi (1988) for evolutionary economics. In spite of the fact that this project deals with cross border collaboration in the educational sector, we can certainly become influenced as well as inspired by scholars from other research fields.

Since the intertwined perspective of social and technical issues has been enhanced in different sectors, a closer look at the specific sector of education in a Nordic setting becomes important. For example, in general, Nordic teachers are more willing to use information and communication technology in education than other European countries (OEDC 2009) and in particular, Danish teachers are most willing to use technology in education compared to Norway and Sweden (OEDC 2009: 65). At the national policy level, the same study report that apart from Sweden, most Nordic countries has shown increasing interest in digital learning resources (OEDC 2009:67).

Taking these issues into consideration the project has to deal with a number of variations regarding access to and use of digital tools for learning in a Nordic setting. Each nation has its own possibilities and challenges to start with and the project idea is to connect actors that belong to these nations bounded areas of practices and restrictions to each other.

This paper report on empirical findings from the first phase of the GNU project that started with a pilot in which participating classes was expected to do a first collaborative trial in order to be able to improve the next collaboration phase.

1.1. Project description

This project deals with educational challenges with cross border collaboration and user driven design. The core of the project is about innovation. Innovation in this educational context is defined as ideas translated into improved and new practices. Evaluation research in education attempts to identify “best practice”, consequently, innovation is the development of “next practice” (oral communication Karsten Gynther, 2012-05-12). The project is grounded in a philosophy of user-driven research-based innovation. Users are both teachers and students in schools. The development of new forms of teaching takes place in a co-design process where students, teachers and researchers work together in different ways, crossing the boarders of the three Nordic nations of Denmark, Norway and Sweden. If this Nordic innovation network in education and the upcoming concepts and models from this work can be implemented broadly, the general aim of the project is achieved by supporting new collaborative practices in education. The goal is the development of robust concepts and principles that can be used by other schools and educational institutions.

It is therefore important to make attempts to upscale the amount of project participants, preferably with organic growth, where an increasing amount of different teachers and students are developing and testing concepts and principles. It is of

---

1 Karsten Gynther at University College Sjælland (UCS), Denmark, was the initiator to the Nordic collaboration in the GNU project. Additional academic partners together with UCS in Denmark are University of Vestfold/Eastfold in Norway and University West in Sweden.
The utmost importance to make as detailed descriptions of the developed concepts as possible to be able to identify obstacles and hurdles to be handled, as well as identify strengths to be maintained. Thorough documenting of the importance of local contexts are acknowledged as well as the process of reflection among users regarding how robust a concept/model seems to be in order to find what kind of experiences can support the build-up of different models that later can be generalized and developed further.

The project is grounded in four subject areas: mathematics, native language, science and social science/history. Digital technology is one key resource to connect the classes. Another key resource is the principal since s/he makes the decisions regarding participation for students and teachers at each school participating in the project.

1.2. Purpose of study

The purpose of the pilot projects was to test technology and practical working arrangements for cross-border activities, to identify the technical, practical and organizational solutions and barriers/problems with cross-border activities so that these experiences can facilitate the more time consuming and subject oriented activities in the next phase.

1.3. Class match groups

In this section of the paper, all the schools and municipalities from the three different Nordic countries are presented.

Table 1: Summary of the schools in cooperation in the class match groups and municipal in the respective Nordic country of the GNU project during the period 2011-2012 in mathematics.

<table>
<thead>
<tr>
<th>Country</th>
<th>Math A</th>
<th>Municipal</th>
<th>Math B</th>
<th>Municipal</th>
<th>Matte C</th>
<th>Municipal</th>
</tr>
</thead>
</table>

Table 2: Summary of the schools in cooperation in the class match groups and community affiliation in the respective Nordic country of the GNU project during the period 2011-2012 in native language.

<table>
<thead>
<tr>
<th>Country</th>
<th>Native language A</th>
<th>Municipal</th>
<th>Native language B</th>
<th>Municipal</th>
<th>Native language C</th>
<th>Municipal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>Glasbergs Skolan 6. kl</td>
<td>Mölndal</td>
<td>Kapareskolan 7. kl</td>
<td>Kungälv</td>
<td>Ytterby 7. kl</td>
<td>Kungälv</td>
</tr>
</tbody>
</table>
Table 3: Summary of the schools in cooperation in the class match groups and community affiliation in the respective Nordic country of the GNU project during the period 2011-2012 in science.

<table>
<thead>
<tr>
<th>Country</th>
<th>Science A</th>
<th>Municipal</th>
<th>Science B</th>
<th>Municipal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>Gulkogen 9. kl.</td>
<td>Drammen</td>
<td>Kjølberg 7 kl.</td>
<td>Fredrikstad</td>
</tr>
<tr>
<td>Denmark</td>
<td>Baunehøj Skolen 8. kl.</td>
<td>Roskilde</td>
<td>St. Jørgen 7.kl</td>
<td>Roskilde</td>
</tr>
</tbody>
</table>

Table 4: Summary of the schools in cooperation in the class match groups and community affiliation in the respective Nordic country of the GNU project during the period 2011-2012 in history.

<table>
<thead>
<tr>
<th>Country</th>
<th>Social science/History</th>
<th>Municipal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>Rødsskog 6. kl.</td>
<td>Drammen</td>
</tr>
<tr>
<td>Denmark</td>
<td>Absalon Skole 7. kl</td>
<td>Roskilde</td>
</tr>
<tr>
<td>Sweden</td>
<td>Glasbergsskolan 6. kl</td>
<td>Mölndal</td>
</tr>
</tbody>
</table>

2. User driven design-a bottom up process

The overall approach combines established methods such as Design-Based Research (see, eg Design-Based Research Collective, 2003) and Action Research (see for example Adelman (1993) about the method’s origins “Kurt Lewin and the Origins of Action Research”). Design-Based Research (DBR) is described by Wang and Hannifin (2005) as a systematic but flexible methodology aimed at improving teaching practices through iterative analysis, design, development and implementation based on collaboration between researchers and practitioners in a real situation and results in context-sensitive theories of teaching practices.

Action research values the power of reflection, discussion, decisions and actions (operations) of “ordinary” people who participate in collaborative research on their own everyday problems (Adelman, 1993). Action research and reflective practice (Schön, 1983) is considered to be critical dimensions for the professional development of teachers (Leitch & Day, 2000). Holly and Whitehead (1986) points out action research as a powerful method when teachers work alongside a researcher in a sustained relationship and highlight its usefulness when the work also involves other interested parties like university departments and sponsors on the periphery. After 15 years of experience in action research based in professional development of teacher, López-Pastor et al. (2011) claim that the method with its collaborative and empathic focus rooted in everyday practice, promotes a sustainable, effective development of quality teaching. The methods can be combined, as shown by Majgaard et al. (2011) on Action research methodology and successfully complementing Design-based Research, by focusing on increased participation and empowerment of teachers and students.
2.1. The use of a multi-method approach to capture project activities

In order to capture the variation of the different activities in each class match group in each subject, the research team of Nordic colleges has used a range of methods. In this project, grounded in the philosophy of user-driven innovation based in every day practice of practitioners, a multi-method approach is well suited with the theoretical underpinning of design-based research focusing especially on what teachers and students do and how they experience their learning situation. The vast amount of collected empirical material from the pilot project consisted of interviews with teachers, students, principals and IT support staff, classroom observation during project activities, online discussions, blog comments shared online and online questionnaires.

In this paper, we have used parts of the collected material as illustrations of what challenges the teachers and students have experienced during the pilot project in each class match group.

3. Case descriptions

In each of the four major subjects involved in the project i.e. mathematics, native language, science and history, class matches were made so that one class from each country was connected thus creating their own virtual class match group. All project participants, apart from students, met in a kick-off meeting in order to discuss and plan mutual activities. Each class match planned and conducted different activities and these are described below.

3.1. Virtual Class match group-mathematics

The mathematical group was one of the two largest groups in this phase of the project. In total there were 8 classes from 7 schools in 5 different municipals from the three Nordic countries, involving 13 teachers and about 200 students as well as 4 IT-staff members.

3.1.1. Group A

The group A was at start extremely positive and ambitious, which resulted in a likewise ambitious initial plan. Suggested student activities included a general class meeting, student-created presentation videos as well as short verbal presentations. Furthermore, in January they planned to have an entire project week, where students would teach each other about concepts, do problem solving together, and create movies how to divide. Teachers would teach the Nordic cross-border class. Later in the spring, a statistics project was also planned. The general idea was to meet socially first, and perform more mathematical activities later. The communication between the teachers was frequent and intense at first and the group sparkled of enthusiasm. However, the enthusiasm and commitment diminished over time due to a range of difficulties.

Before the students started to work with their task, the teacher group experienced difficulties to connect. The difficulties to connect were linked to technical issues as well as social. Technical issues included not being able to use the same communication software due to local restrictions or having planned videoconference meetings not put through due to lacking voice or video. To find times when everyone were able to join synchronous meetings during the day was difficult, which resulted in late meeting from their homes but such solution was not acceptable to all parties. The group had additional
communication difficulties due to a non-Nordic native speaking participant for whom the mix of Danish, Norwegian and Swedish in the conversations became extremely challenging to comprehend.

Despite these difficulties, they eventually agreed upon an initial task to do with their students; to present the numbers 1-20 in each other’s languages. Danish and Norwegian students choose to do this task synchronously counting live in a videoconference meeting, whereas the Swedish students created videos presentations of “counting to 20” which could be viewed anytime. The students made the presentation a little more interesting by illustrating the verbal counting in 4 different ways: by rhyming, rapping, painted figures illustrations, or illustration with the fingers. After this first task was conducted, the group regained their collaborative energy and continued with several other tasks.

3.1.2. Group B

The group B started off a bit tentative, but ended up with a specific and realistic plan directly at the kick-off meeting. The plan included to perform a synchronous class presentation where the students introduced themselves to each other, to crosswise exchange their mathematical textbooks with the intent to compare and solve problems from each other's books, to present different computational methods to each other, and finally to conduct a smaller statistical exercise comparing the Nordic countries in some relevant aspect. Also in this group a social meeting was planned first, followed by subject content later. The group had some difficulty to find flow in their work and to find common time to meet. The frequency between group-activities was quite low. The first student meeting between the three countries was not conducted until early March and after that the activities in this group declined again.

At the meeting, students from all three countries participated simultaneously in a videoconference setup. According to plan, students would present themselves in groups, count to 30 in their respective languages, and then explain what some geometric concepts were called in their language. In Sweden, students sat in a small room outside the classroom with 4 chairs behind a table. They were online on Skype with 3-party conversations using only a small laptop on the table. The groups were called in one by one, while the rest of the class mates remain in the class room. The session began with some technical problems, but after 10 minutes they could all hear and see each other. Because of the delay it was decided that each group should do the enumeration task only, the geometry task was removed. The students listened attentively to each other’s enumerations, and most seemed to conclude that Norwegian numerals are basically the same as Swedish, whereas Danish numerals are slightly different after 20. Each group activity took a total of a few minutes. Some students refused to appear in the image but all of them participated, did the their counting and listened to each other.

3.1.3. Group C

The small group of three teachers from Sweden and Norway started of very well at the kickoff meeting. They described their respective schools and school systems, exchanged experiences and were entirely autonomous. They quickly got into pedagogically interesting discussions, discovering that both parties were interested in working with problem solving. They designed the task for the students having a content perspective from start, resulting in that students would construct “julnötter” to each other, [julnötter is a smaller, preferably tricky, mathematical problem with a Christmas theme], packaged
in a Christmas card. After Christmas students would try to solve the “julnöt” they have received, and in mid-January students would meet in Skype and share solutions and answers. All activities were performed according to plan.

In Norway, an interactive whiteboard was used whereas in Sweden the students used a surf tablet and projector for the synchronous presentations of the students’ work.

The teachers on each side (Norway and Sweden) started the session by greeting each other. Each student that presented the answer of the math problem they had been working on approached the surf tablet in Sweden, and the interactive whiteboard in Norway. The meeting was organized so that they approached the video camera at the tablet/whiteboard one by one. They started by introducing themselves and told whose mathematical problem they had been working on. Then they presented their solution and the problem constructor gave feedback on the response. However, a relatively large number of Swedish students had forgotten the correct answers to their own problem, and did therefore not know if the Norwegian student’s response were correct or not. Some disappointment from the Norwegian students did show, even if they tried to hide it. The situation was handled by providing general feedback and then move on to the next presenter.

The solution presentations took almost an hour. After the presentations, the Swedish students reflected upon the meeting. All 22 students had something positive to say about the meeting. Most students thought it was fun to see and talk to the Norwegian students. They also commented that they thought that the Norwegian students were good at math, and that it was “cool that it was live”. Some admitted it was a bit nervous to talk. Most Swedish students commented that it was pretty embarrassing that they had no answers to their own constructed mathematical problems. One student also noted that the Norwegian teacher had all Norwegian students’ responses collected and could therefore help if a student was absent or could not respond of some reason.

3.2 Virtual Class match group -native language

In the planning of the pilot projects all three language groups worked on the premise that students had to learn each other’s language and come to know their respective countries. The focus was directed towards learning to communicate and convey their expediencies of the cultural and linguistic similarities and differences between the Nordic countries. The students shared their experiences across borders in the form of synchronous and asynchronous meetings and digitized presentations where the spoken word was supplemented by images and text. The contents considered presentation of their school and school system, activities during leisure time, etc. The students gathered information in printed sources as map books and brochures and created mind maps, manuscripts, film presentations, etc. They held direct talks in synchronous meetings on-line. Below is a brief description of the contents of the three groups of pilots.

3.2.1. Group A

The group worked out a particular theme for the pilot assignment: “Everyday life in the North”. The students’ were to make presentations in the program Voicethread that would illustrate a content of an everyday life in their respective country (for example descriptions of the city, nation, school/education, culture, etc.). The illustration should adhere to some type of genre requirements: (rap song, story, article or recipe). An
ambition was to overcome the language barrier and try to combine text and images in such a genre framework. After that, the idea was that students should give feedback and respond to each other’s presentations Punkt här eller har text fallit bort?

The assignments were in general well-planned during the pilot with a clear structure during the lessons, including both individual work and work in groups. The students were encouraged to carry out the tasks in different ways, e.g. when answering questions the students could write their answers on a paper, on iPad, or record their answers in iMovie. The majority of students chose iPads. Previous material as the mind maps constructed in the beginning of the pilot were reused and compared to the final products, the presentations.

Voicethread was used as the main IT tool for flexible presentations and expanded opportunities to comment. The presentation could be constructed in the program as a slide show accompanied by audio and/or video narration, or be chosen for uploading a finished produced film. The majority of the Danish and Norwegian groups uploaded their finished productions, while many of the Swedish groups made their presentations in the program. The Swedish students were particularly good at creating presentations with high receiver consciousness where the language spoken continuously was supported by text and illustrations. As both teachers and students has mentioned in the interviews, the program’s response capabilities were not fully exploited in the pilot project.

Skype was used primarily for two purposes: firstly, in a teacher-to-teacher communication and coordination of the project in itself and; secondary as a communication tool between student groups to fulfill their presentation and response assignments.

3.2.2. Group B

In Group B the assignment was to let the students work out and produce videos about each other’s countries, based on their perceptions of each other. As in group A they were to choose a subject matter issue such as themes like school, leisure time, something typical Swedish/Norwegian/Danish, food etc. The Swedish students would then produce two videos - one for Norway and one for Denmark, and similar to the Norwegian and Danish students who also would produce two videos. The teachers in each country established goals for the subject matter content on the basis of the national content requirement, for example:

- to include a Nordic perspective where Nordic languages should be taught in order to learn, communicate and participate in conversations about the content and meaning of linguistic differences and similarities
- to examine similarities and differences in pronunciation, meaning in Danish, Norwegian and Swedish.

At the end of the pilot project the students were asked to give feedback on the videos and relate to the ideas they may had about each other - expressed in the videos.

Looking specifically what happened in the Swedish classroom while executing the assignment it was observed that the teacher initiative was ambitious and well prepared with clear instructions on the whiteboard. The students conducted a rather structured assignment work. Given the instructions they worked in groups of about 4-5 students. They produced videos of what Sweden was famous for. In their presentations, the students were very serious and polite to each other and to the “listener”. In the preparation phase much time was spent on technical resources and their availability.
There was a limited availability of video cameras so they needed to borrow from an art teacher. Furthermore, they arranged for using their private video cameras as well as smart phones, both students’ and teachers’ so the problem was solved in relation to what was available at the time for them.

Teachers in the mother tongue group B chose Google + as a common tool, since it was considered to cover their communication needs. Google + has the opportunity for asynchronous messages in different modalities (text, images and video), chat and video hangout (like Skype). Google + is basically a tool for networking (like Twitter and Facebook). The three 7th classes were divided into 5 groups each with their own Google account. The groups have then followed each other. The starting point was that “Absalom School A” would follow “Kapare Skolan A” and “Selvik Sande A” etc.

3.2.3. Group C

This group started up well and had a quite clear idea of their pilot study. Generally they had some communication problem as well as software problem but all together the teachers were very ambitious and had long experience from various projects of IT in school. For this GNU project the Swedish teacher had some worries about what resources to use, both time as well as hardware and software possibilities. With her long teaching experiences she was very solution-oriented and pragmatic. She collaborated with her Nordic teacher colleagues through Skype, and to some extent, Basecamp, and thought it worked well, but wanted to have their communication and decisions written and all documented on paper, to ensure decisions and plans for their coordination.

This group C worked very similar to the other two groups in the case that students should learn about each other (habits, culture, language, etc). From well-prepared instructions, the students worked in groups and were highly keen about the GNU project. Every GNU activity was linked to and started from a curriculum goal:

* to learn and understand the culture in the Nordic countries and their languages.

Furthermore, the Swedish teachers had decided on a policy rule about how digital artifacts were to be used within the classroom. When teachers are going through educational instructions or examination it is not allowed to have the computer open. Another example is to not have an open program that is not used to solve the task or assignment (Facebook for example), silent cell phones etc. And if more than one thing is exceeded over these policy rules, the teachers emailed home to their parents as a report.

In the GNU activities we observed in the classroom, the students chatted a lot in the beginning but after a while they started to work in their GNU groups. The teacher’s pragmatic approach was mirrored on the students work and a positive attitude rubbed off gradually.

In this group they were working with presentations in the program Present.me. They experienced very good interaction with integrated text- and image presentations. Present.me is a tool that is distinguished by the ability to combine text, sound and image in an orderly manner. The program is designed to present slide shows, and the screen is divided into two parts, the presentation appears on the left side while the presenter/sender appears on the right. The program has its strength as a presentation tool, but is not suitable for discussion and communication. A follow up focus group revealed that students did not get the program’s commentary feature. Some problems with parallel logins were also faced.
3.3. Virtual class match groups – science

Science group A consists of 3 teachers and about 75 14-year old students and science group B consists of 3 teachers and about 74 12 and 13-year old students. The two participating Swedish schools, Kapareskolan in Kungsbacka and Thorild School in Kungälv, worked with a weather observation project in the pilot study. They measured the basic weather facts with classical measuring equipment that existed at the school as a barometer, thermometer and hygrometer. The values measured were temperature, humidity, barometric pressure, cloud cover and precipitation, (they got no precipitation during the measurement period that was dominated by a lengthy high pressure). They also recorded sunrise and sunset on SMHI's website.

The class was divided into seven groups of three or four students who were responsible for the respective measurement variable. Data were compiled and presented in the tables that were constructed by one of the Norwegian teacher colleagues. The results were reported between Norway and Sweden in Google +. In Kapareskolan, project was linked to the teaching of physics, meteorology and thermodynamics. This was not done in the Norwegian and Danish classes. Each group presented their findings with charts, graphs, short fiction and conclusions. To the Norwegian class and believed that it probably would not have worked in a three-party setup. For Skype calls, the teacher let the students work with a structured task but also to “mingle” with each other.

The science teacher at Kapareskolan emphasizes that the most important thing is to have an educational idea. “If you have that, you would address the technical or organizational problems that may arise” she said. Still, it was difficult for students to give feedback on each other’s work linked to subject content. They mainly gave feedback on the form of the presentation. In this phase of the study, the students have shown interest and thought it was fun, but would appreciate more interaction with the students in the Nordic countries.

3.4. Virtual Class match-social science/history

The social science/history group was the smallest group in this phase of the project. In total there were 3 classes from 3 schools in 3 different municipals from the three Nordic countries, involving 4 teachers and about 75 students as well as 3 IT-staff members.

Right from the start at the kick-off meeting, the social science/history teachers used a very pragmatic approach. Within minutes they had checked out the age of the students they are teaching, which subject matter they should focus on, which days of the week they should use for GNU related work and how much time they could spend during that work and a got an overview of each scheduled activities in their respective class for the weeks to come. They easily concluded it wouldn’t be possible to do anything substantial before Christmas, and combined that insight with the idea that students’ need to know each other. A Christmas-greeting was agreed upon, to be shared on a blog. Synchronicity in sharing greetings was ruled out without even being mentioned. Later, in the classroom, some dimensions emerged that had not been thought of at the beginning. It turned out that time was cricial, as the weeks before Christmas were crammed with things that had to be done. But eventually the Christmas greetings came online.

The students discovered when listening to the greetings that decoding other Nordic languages was not as easy as expected.
After the greetings was shared, as next step according to the planned activities from the kick-off meeting, was to let students formulate and exchange questions about each other’s towns or countries and their local history. The distribution model of the question was that questions from Sweden were to be sent to Norway, from Norway to Denmark and from Denmark to Sweden. Swedish students complained several times about this, since “everything important happened in Denmark”, as they put it. Eventually they came up with a couple of questions about historical milestones, buildings and kings. During history lessons they discussed other problems, e.g. the proper naming of a king playing an important - but controversial - role in Swedish and Danish history. At this point some tendencies toward student-driven innovation were quenched due to a schedule that already had gathered momentum.

Questions from the other schools were to be answered by movies, which took quite some time to produce. The Swedish students did some research by visiting a museum, asking around and searching the internet, but spent even more time dramatizing their answers and developing a comprehensive narrative. Gradually they became more aware of their and others language, mainly how to speak in order to be understood. The teachers addressed this question, too, and came up with the idea to subtitle all movies. Unfortunately, other software problems took most of their time, e.g. converting different input movie formats into one unified quicktime-movie. In this phase of the project, technical questions like software difficulties, platforms, and network restrictions due to local policies dominated.

In summary, while the simple task of getting things going and using well known tools like blogs and movies dominated in the beginning, the Swedish participants increasingly had to struggle with technical questions like movie formats, network policies that were not expected on the outset. In addition to technical issues, language emerged as an issue to be dealt with. Didactical questions like others perspectives on historical events, what is important and true in history and why, and how stories should be told have increasingly moved to the foreground. To some extent, the shift from knowledge consumers to knowledge producers has started to have an effect on students’ history awareness.

4. Results and analysis linked to major thresholds so far

Looking more closely to each presented case in the different class match groups, we have seen obstacles in three major areas, linked to four different levels of analysis that will be described below.

Heretofore findings show that the topic-oriented discussions have been put back due to three major thresholds to overcome. One is related technical difficulties in schools when their diverse IT systems are to be synchronized. Another threshold concerns coordination when the different schools’ different schedules must be taken into account in order to create possibilities for cross border collaboration. And the third threshold so far is linked to certain linguistic difficulties when the Nordic participants communicate in their respective Nordic language, which is part of the project’s overall aims.

4.1. IT-related difficulties at three levels of analysis

In each class match group difficulties arose when it came to dealing with the digital technology in the various pilot projects. All participating teachers expressed frustrations
as well as surprise that the arrangements regarding use of digital tools and systems were trickier than expected. Detailed analyzes of activities in the pilot projects showed that these problems were due to conditions at different levels. Some of the issues could be found at the municipal level, other could be seen at the school level and yet other issues were connected to the individual class. Thus the ‘window of actual possibilities’ became rather narrow, as indicated in the visual model below where the arrows in the model meet.

Figure 2: IT-related difficulties at different levels.

4.1.1. Municipality

The design of the study included eight different municipalities in the three Nordic nations (one in Denmark, three in Norway and four in Sweden). The variations among the participant municipalities and their diverse policies and regulations, regarding use and access to digital systems and tools that were used in the pilot project, showed the importance of the municipality level for what could be done such as what schools could use what type of platforms for communication as well as what types of software that could be downloaded if any.

Further it was shown that the local network policy influenced what has been possible to do at different times depending on traffic on the network, which was specifically for the municipality of Trollhättan in Sweden and Drammen in Norway. Consequently, groups that worked with schools in the municipality of Trollhättan or Drammen, became affected by this and the seemingly smooth and simple solutions were impossible due to technical circumstances.

However, network condition was not the only explanation for problematic IT use. The municipality in Trollhättan had also a policy regarding billing practice so any services that required a credit card was impossible since that was not allowed. So when the teachers in one of the math groups wanted the students to have a three party Skype video session, that was not possible at the first instance. One of the difficulties that could be identified in this particular municipality was that even if teachers had permission to download programs in the schools they could not download the version of Skype that enabled three part video communication as it requires a credit card for payment at that time, which was not allowed in the municipality as payment methods. Here we see an example of how an administrative routine explains why a technical solution is not
feasible. The way around this problem was solved by letting the Danish school call up the rest of the participants and thereby the practical issues could be side stepped at that particular time.

Still, issues related to municipality regulations was also acknowledged by teachers regarding what type of digital activities they were able to do, as one teacher said:

“Programs do not work on school computers because the system is locked by the municipality. We can, for example, not play videos in MP4 format.” (Danish teacher)

4.1.2. School policy challenges and leadership

At the school level, the policy at each school and the support from the principal was important for how students and teachers could and will be able to communicate and collaborate with in the framework of the GNU project. A questionnaire regarding policy regulations linked to digital technologies was distributed to all principals at the different schools in the GNU project. So far, 8 principals out of 14 have answered the questionnaire, 1 Danish, 4 Norwegian and 3 Swedish.

For example, different schools have different policies regarding use of students’ mobiles.

mobil: ikke tillat brukt i skoletiden [mobiles are not allowed in school] (one principal in a school in Norway)

In contrast to that, a Swedish principal says:

Lärare styr när eleven får använda sin egen mobil/smartphone [It is the teacher who decides if the students are allowed to use their own mobiles/smartphones]

Apart from local policy arrangements concerning digital tools and systems, municipal regulations about digital archiving also differ. One principal in Norway said there are strict regulation in their municipal

digital arkivering: strenge kommunale regler:[digital archiving: strict rules in the municipality]

Whereas in Sweden, one principal said that there are no rules at all. It also seems like different principals were involved and supporting the project in different manner. Some have become more involved than others and some experienced the project to be more relevant than others in relation to the overall school work. Comments such as:

We try to get the teachers on track. We support them with all we can, even with time reports.

It’s important to have an open mind because we don’t know how it’s going to end.

As well as:

It’s a risk that we’ll drown into the administrative issues without seeing the advantages

It was an order from the ICT-unit of the education authority of the municipality [that we should participate].
Comments like that were seen as tentative indicators of variations of involvement and sense of relevance fueling their support as principals to the teachers working with the GNU project together with their students.

4.1.3. Classroom challenges

Looking more closely at the access to digital tool and systems, differences could clearly be seen. In particular the differences were linked to student access to computers and if they were allowed or not to access internet. In this phase of the project, these issues became problems in the classroom since these problem regarding network capacity and program accessibility was not really something that had been an issue before working together in a Nordic cross border setting. The problems were faced at the same time as the students were supposed to do things together, and then of course, got disappointed when things did not work out as expected.

In one school in Norway, the principal described that each classrooms was equipped with an interactive whiteboard with a classroom computer linked to it. They had a computer room with 19 computers that could be booked via a school based system. They also had some extra laptops for students. All the teachers had access to laptops or stationary computers, but it was unclear what type of access they had so this needs further clarification.

In one school in Sweden, the access to computers was that each classroom had projectors and the students in grade 6 had 1 laptop on 4 students, and that students in grade 7 to 9 had one laptop to each student.

The experience from teachers regarding access to technology varied due to network capacity as well as policy regulation based on who was allowed to install program on student computers. 14 out of 29 teachers have so far answered the online questionnaire asking about IT use in the project. We are expecting an increasing number of answers, but here we report the respondents’ answers to provide a description of their understanding of possibilities and constraints.

Insufficient line capacity to skype 10 wireless computers simultaneously. It was too much work having to install Skype on 10 desktops around the school. Important that students can spread around to talk undisturbed. (Norwegian teacher)

There are too many problems with programs used at the various schools as well as capacity. (Danish teacher)

Connections. The availability of the different countries. Offset in time (Swedish teacher)

Skype is not installed on the students’ laptops. I have no account to be able to Skype with three simultaneously. Denmark is not allowed to use Google +. The sound was bad. (Norwegian teacher)

Computers are old and do not work, computers are not updated and it may take up to 30 min. simply to logg on! - New computers please. (Danish teacher)

Teachers also wanted to share their experience regarding difficulties they experienced when they were faced with hands-on activities such as student work with movie making and sharing of files.

We had problems with the video formats that are not working together - and we had problems on Google + with one hand to open the videos that we shared, and to upload and download them. (Danish teacher)
4.2. Coordination challenges

Yet another threshold to overcome was linked to aspects of coordination. Since teachers were organized in virtual class match groups, they needed to talk to each other and plan the mutual activities for their students in each class located in each Nordic country. This worked out differently for the various class match group. In math group A for example, they had difficulties due to their day time schedule. Therefore they tried to communicate at night from home, but that did not really work out either, as described in section 3.1 of this paper.

Real time coordination for the history group never occurred during phase 1 of the project since they had a very hard time to find time to meet at all in a synchronous meeting, and when they tried to use Skype it did not work out since the Skype connection to the Norwegian teacher did not come through.

Other challenge linked to coordination was how to find time for students to connect in real time. Time constraint regarding when to fit in GNU related activities was seen as somewhat problematic so solve for teachers.

*It is difficult in a hectic schedule to make time to plan and implement. There is much to be done in grade 7 GNU is just one of them ...*(Norwegian teacher)

And many teachers wanted more help in the next phase regarding the technical aspects for coordination of activities no matter what kind of type of systems or digital tools they plan to use.

*The technical problems needs to be solved between all three countries share first, then students can contact each other more freely.* (Danish teacher)

In general, the pilot project in phase 1 of the GNU project revealed a range of issues to deal with for the coming phase 2 in order to avoid coordination problems that can be solved in advance since specific problems has been experienced by individual teachers and students.

4.3. Linguistic challenges

One key project rule for all to follow was that communication between project members should be held in the national language. This communication rule was linked to the ambition of keeping the Nordic profile of the GNU project as well as an idea of increased language competence among all project members’ such as students, teachers, IT staff, principals and researcher-thus equal linguistic challenges for all.

In general, the Swedish students in the three mother tongue groups express difficulties understanding the Danish which was also expressed by the Swedish students in the math groups that Danish was harder to understand than Norwegian. In the implementation of the pilot in the mother tongue groups, in general, all the participants (teachers and students) express a varying degree of difficulties to understand the Nordic languages. In particular, it concerned direct speech in synchronous meetings and in the student presentations. There was a lot of discussion going on about what was actually said when listening to the Danish students. Reasoning about and associations to the
respective language's vocabulary and the counterparts in the mother tongue demonstrate examples of lecture elements with the objective to develop language awareness among students.

However, only minor attempts were carried out to systematize the linguistic differences, for example by creating word lists and the like.

Looking at the blogposts in the social science/history group, it became evident that understanding each other between the Nordic languages was generally hard. It was expressed by all the students from the three nations. Students that spoke slowly in their presentation was getting positive feedback from the other students saying that that made it easier to understand and follow that they talked about in their videos.

But it was not only students that said that they had a hard time, still possible though, to understand the national language of the others. Also teachers experienced it problematic as well as the researchers. And it seemed like it became especially hard for those who did not have some of the Nordic languages as their first language.

4.4. Efforts to overcome the thresholds

Combining all the difficulties mentioned above it might be seen as a hopeless task to come to terms with all the challenges at the various levels. But on the contrary, the people involved at all instances has shown both stamina and courage combined with a firm confidence that problems should be solved and it is worthwhile to endure. Some examples, interpreted as signs of effort to overcome thresholds, are presented below.

For example, at the municipal level, action has been taken in order to look more closely at some regulations that might be able to change, and also defining routines to follow in order to identify technical issues at a much earlier stage, this is done in the municipality of Roskilde in Denmark.

As for problems linked to the school level, a principal in Norway has started to work much closer to one of the IT staff member to involve IT competent people as early as possible when teachers are planning for their activities.

At the classroom level, teachers increasingly want to ask their student what type of collaboration tool they would like to use when connecting to the other students in their individual virtual class match group.

IT-staff from the different nations want to collaborate together more narrowly in order to inform each other about the technical and policy restriction from the municipality they have to work in line with. They want to find creative, common and practical solutions for the different class match groups in order to more actively help and support teachers’ pedagogical ideas.

Teachers are having an upcoming meeting were all teachers will meet, in their respective countries at the same day with connections to their colleagues in each virtual class match group. The day will be spent on planning for the upcoming activities for their students in the fall.

And finally, teachers also are keener and feel a strong need to work more closely to the subject matter together with their colleagues in the virtual class match group rather than spend their most of their precious time on technical and practical issues. Teachers also express a wish to involve the researcher more into their activities to get help and support as well as a sparring partner.

In order to deal with the linguistic problems, student presentations are increasingly combining voice with text. They are also developing a protocol to speak very slowly both in real time meetings as well as in video productions.
Coordination issues is still not actively dealt with, but the hope is oriented towards the principals to realize the need to planning in advance and time explicitly set aside for coordination activities within the GNU project.

5. Conclusions

Next phase in the GNU project will put pressure on all participants. In general, more active involvement is required by all, but not all the time, just when GNU activities will be planned for and executed.

The pilot projects demonstrated the capacity to meet and develop in contexts outside the classroom and the benefit of having an authentic recipient and partner. Virtual meetings between students manifested the potential for didactic development and suggested that the primary sources such as speech benefit from being supplemented by other modalities and means of expression to enhance understanding, something that today is supported in the digital media. These social “rooms” have created a curiosity and motivation to communicate further, more informally through the administrative interfaces. Availability of technological equipment, its limitations and quality, teachers’ skills and needs of try-outs and testing, and regulations concerning the use of IT and software at the municipal level were some of the critical factors for project implementation.

In the next phase in the project it is important to build on these experiences and develop students’ competences and teaching designs based on didactic approaches that are more systematic and consciously make use of technology in the cross-border perspective. For example, focusing on the learning objectives becomes crucial as well as and seek to develop teaching methods that take advantage of students’ competencies and development and give students more autonomy. In the coming phase of the project we should also make explicit opportunities for the students to participate and being active in the selection of content, digital tools and ways of expression and especially in cross-border cooperation.

The call for more in-depth analysis regarding type of communication forms, such as the need end benefit for synchronous or asynchronous solutions is important. The struggle with the technology must be reduced in order to keep the energy level high for the involved participants. The next phase should therefore be permeated by didactic discussions rather than technical, as it was in this phase of the project, thus the role of the IT staff is enhanced and they should be more actively engaged and consulted as a support to the didactic planning by the teachers.

As mentioned above, the students also need to be more explicitly involved since they are one of the core users in the GNU project. Since user driven design and user driven innovation is the rationale for the whole project, students are very important for model innovation. Consequently, the network of students linked to teachers, principals, IT staff and researchers are to be even more vitalized by upcoming tasks to do together with a focus on each school subject. Lessons learned from other Nordic network initiatives also calls for common task activities.

Our experience of other similar international networks is that without tasks to perform together, networks erode quickly. The strongest network-creating mechanism is to work together on an actual task, meeting deadlines and producing common results.

(Dannemand- Andersen et al., 2007:53)
The strongest emphasis in the upcoming phase should thus be on bringing more subject focused activities into the network of involved actors to continuing to deal with educational challenges with cross boarder collaboration and user driven design.
References


