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**Professional evaluation of project “Exiting Science for Sustainable Development”**

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**Background**

The project partners are Narva Language Lyceum in Estonia and Narvik Upper Secondary school in Norway. The project teams are teachers of biology, physics, chemistry, geography and English. During 17 months the teachers have developed and tested the materials and made an e-version of the tasks (e-compendium) that will be open to public. The tasks have a cross-curriculum meaning and integrate several subjects. The project period has been from September 2014 to February 2016.

The defined subjects involved in this partnership project are English, biology, chemistry, geography and physics.

Number of tasks for each subject; English (5 tasks), biology and chemistry (11 tasks), geography (11 tasks) and physics (5 tasks). Total number of tasks within this project of environmental education; 29 different tasks.

**Evaluation of language tasks**

The number of tasks and the variation of subjects are more than sufficient in order to improve the skill of written and vocal English to the students. Considering the groups of students solving each task will consist of both Estonian and Norwegian students, one should expect most of the dialogue and discussion within the groups would be in their common language English. Working with each task will demand extensive use of internet, and sites with information in Norwegian or Estonian language will have to be translated to the other half of the group. Students will therefore be forced to express themselves in English on a large scale while working on anyone of the tasks described in the project. Both written English making the notes and reports for the group, but also using spoken English co-working in the group and discussing the different findings during mission work. Solving the project tasks will improve each students individual competence in everyday English, but more useful, it will also extend their knowledge of technical words and expressions used in science subjects.

**Evaluation of geography tasks**

Geography task 1 – 7 and 8.2 are practical and theoretical student work related to issues in Lahemaa National Park situated in northeast Estonia. Geography task 8.1 expects use of atlas/map with questions related to the Island of Vilsandi in western Estonia, with the Vilsandi National Park. In addition to these nine thematic tasks related to Estonia there are three tasks related to more general themes as “Protection of the environment and sustainable development”, “Field excursion to the valley of Rombaksbotn in Narvik” and “The Lake as an Ecosystem”. Each task-paper or task description starts with a definition of a particular educational aim or goal. As example geography task number 2; “Aim: To describe the climate of the national park and analyze the influence of a climate forcing on the climate of the region.”

Further, the sheet describing the educational aim and tasks, also mention other integrated subjects related to these particular tasks. As example task 2; “biology, physics and mathematics”.

Mentioning expected equipment for the particular task is also useful information for the students. The geography tasks varies both in lengths and issues and give the students opportunities to choose degree of specialization at a given time. They can start with a task they perceive as easy and then gradually go ahead with more demanding tasks.

Each task consists of several questions as measuring, observing, reporting and concluding. This is the essence of a classic scientific method. What do you see? How can you describe it? Where can you find knowledge about it and what can it be? What will the consequence of your observations be? What can be the meaning of it? Who should you inform about it? How shall you report about it? An excellent discipline to exercise by each student. Individually and as a group.

The tasks has a reasonable variation of working methods, from measuring temperature (instant and over some time or comparing with statistics), via using scale and map to describe an area or sampling plant or animals from a forest or a lake. Learning to use the expected and recommended tools for the geography tasks is an extra bonus for the students; making notes/using a field notebook during varying weather conditions, using a ruler outside the classroom, using a calculator in the field, using camera, using different kinds of scoops to sample species and using spade and knife. This is all very good practice and expected elementary skills for scientific field work, alas not so common among students as it used to be.

If one should aid a bit of constructive criticism to the geography tasks, which over all are more than sufficient to keep students from first or second grade at the Upper Secondary school, intellectually occupied for several days, it must be the lack of tasks related to modern population geography within Estonia on one hand and northern Norway on the other hand. Mentioning that, it must also be noted a general unbalance between tasks related to Estonia and tasks related to Norway/Narvik. There could be, however, reasonable arguments or grounds for this, which I do not know.

Neither do I have complete knowledge of the educational aims of geography in Upper Secondary school in Norway or Estonia, but as geography tasks for a sub-university level, it is my professional conception that the geography task are well founded and holds a high standard.

**Evaluation of biology and chemistry tasks**

Biology and chemistry tasks are listed as 1.1 to 1.6, 2.1 to 2.3, 3 and 4. Altogether 11 task sheets. Different from the geography tasks, the biology and chemistry tasks 1.1 to 1.5 are organized as five different issues. For each issue the class of students are supposed to be divided into smaller groups of 5-6 students. Task 1.1 is called “Nature conservancy”, task 1.2 is named “Reporters”, task 1.3 is called “Hydrologists”, task 1.4 consists of groups with “Analysts” and task 1.5 are called “Soil scientists”. These issues complete one another and seems logical in order to survey a given biotope. Biology and chemistry task number 1.6 is a common task for every group, and challenge the student groups to find the most interesting facts from their “spot”, and present this findings in an attractive way to the other groups.

For each task the educational aim is defined and there is a list of tools necessary to solve the task presented. To no surprise, and very useful for the students, the number and variation of tools within the tasks of biology and chemistry is larger than for the geography tasks. As example; plastic bags for sampling different sorts of garbage, camera, rubber gloves, voice recorder, laptop, maps, measuring glasses, distilled water, funnels, filters, Phillips beaker, measuring cylinders, thermometers, aerometer, solution indicators, electronic ph-meters, spade and knife, different sorts of field guides for plants, fishes and animals and a weather station. All this is excellent.

Task 1.1 for group “Nature conservancy” has an aim to assess the level of contamination in a given area. Maybe it would be too demanding for the students to analyze and evaluate contamination on a larger scale than just litter, for example the amount of toxic waste from factories, climate damaging emissions from traffic or industry or harmful smoke from burning coal. Just to count empty plastic bottles or waste metal, seems a bit old fashioned nature conservancy.

I see the aim for task 1.2, to create a folder with the purpose of attracting more people to the Lahemaa national park, as a more linguistic or communicative task. Of course such a folder describing plants and wildlife of the park must be founded on acquired biology knowledge, but maybe this task better could have been put together with the geography tasks.

These comments aside, it is my professional conception that the biology and chemistry tasks holds an excellent standard.

**Evaluation of tasks in physics**

There are five tasks in physics. These are; task 1. “Light and humidity”, task 2. “Wind”, task 3. “Measuring density of humid wood”, task 4.1 “Relative humidity of wood species, growing at different altitude above sea level” and task 4.2 “Relative humidity of wood species, growing in places with different soil humidity.”

For each task the educational aim is defined and there is a list of tools necessary to solve the task presented. Advanced instruments as UV- and UVB sensors, hygrometer and lux-meter are exiting instruments for students at second grade, the number and variation of tools within the tasks of physics will be highly educational.

As an example of what I consider to be one out of many good tasks/questions in physics and in scientific thinking in general, is task 1.3 measuring humidity and light to find a possible context between time of day, light, soil and humidity. After measuring the humidity in the air and UV-/UVB light at two different places (open area and area of shade) at four different times during the day, the students are asked to compare and make conclusions based on the material they have gathered. This is great learning based on scientific methods.

Physics tasks 2-4.2 are good examples of how to integrate mathematical skills into subjects of science. Students are expected to use different formulas and calculate the right answers. Though these tasks can seem demanding, they are in my opinion most suitable as group assignments.

**Conclusion**

Altogether the described tasks in English, mathematics, biology, chemistry and physics in the project are varied in issues and difficulty. There are enough tasks to keep students occupied and motivated through several days, including one day of writing reports. The tasks will increase basic and local knowledge of Estonia and Norway, as well as scientific skills. I give my best recommendation of these tasks, they give a rich and complementary opportunity to the students and to the project of cooperation between Estonia and Norway on such issues as described in the projectname; “Exiting Science for Sustainable Development”