From the Québec Educators Home on the Web

Spring Acid Rain Watch: a model of scientific inquiry

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Spring Acid Rain Watch is a collaborative project that involves classes from many regions of the province and the world who communicate using a simple Internet technology. Together, the classes form a team of researchers who share their process, their data and their analysis. Interested teachers can register and their class can become part of this team. [1]

It is one of several "Learn-by-Doing projects offered by the Québec English Schools Network RÉCIT (QESN-RÉCIT). In these projects an experienced project co-ordinator acts as a guide and offers assistance to registered teachers. "Learn-by-Doing" projects model how communications technology can be integrated into learning projects which are in step with the Québec Education Program (QEP). Spring Acid Rain Watch, a science-based project, is a good example of this approach. The complete collection of "Learn-by-Doing" projects deal with most of the major subject areas. [2]

Spring Acid Rain Watch is the brain child of Bob Colvil, grade 5 teacher at Knowlton Academy. The project began as a local classroom project, but found its true scope when the Internet opened the doors of communication with other classes around the world. It was originally developed several years before the implementation of the current QEP but, from the beginning, it addressed a number of the preoccupations of the QEP:

- The project is rooted in a constructivist approach that engages the students actively in their learning.
- Acquisition of essential knowledge of the science curriculum is linked to the development of cross-curricular competencies. Students are not simply requested to learn, or acquire information. They are given access to information which they must **use** to reason and to propose an explanation to a scientific problem.
- Students are challenged to re-examine their personal representations as they construct their understanding of the problem.
- Students embark on a real scientific inquiry. They try to answer a question through data gathering and find that there are no perfectly clear right answers.
- Language competencies, science competencies and cross-curricular competencies all work together as the students use language to get things done, to solve problems, to imagine possibilities, to locate and use information, to communicate with peers in class and abroad, etc.
- The project suggests a process and teaching practices in step with the QEP, while remaining flexible, and feasible in a variety of learning and teaching contexts.

The characteristics of the project

- **A "telecollaboration"** done in partnership with distant classes through the use of Internet Communications Technology. Communication with these distant classes fits naturally in the project and offers real added value.
- **Project and inquiry-based learning** revolving around an integrated task;
- Content and approach **in step with the QEP**.
- A natural context for implementing **co-operative learning** strategies in class.
- Built-in **flexibility** allowing teachers to adjust how they manage the project to fit their specific situation (technology, time, students)
- Seamless integration of **Technology** with a focus on the learning that happens in the classroom rather than on the use of computer technology itself.
- **Authentic learning** situation that engages the students in a real-life problem that they can tackle.

In the classroom, the focus is on scientific inquiry and co-operative learning while students are challenged to understand a real-life problem and to answer a real-life question. The problem is embedded in the question: "Among the many causes of Acid Rain, to what extent is human industrial activity an important or significant factor?"

The backbone of the project consists of five (5) steps:

1- Meet your partners
The class contacts the other participating classes, establishing that they will be working as a team with them.

2- What we already know
Students explore what they already know, personally and as a group. In doing this, they activate their current constructs and expose the myths that they hold to be information. They communicate this current knowledge to the other classes. This becomes a starting point which launches the next step.

3- Research! Learn! Get ready!
A . Students must formulate an enlightened hypothesis but first need to develop a better understanding of the component parts of the problem-question: what is an acid and a base, how rain is formed and transported, what are the possible causes, natural or human, and the effects of acid rain. To achieve this, they engage in documentary research which lends itself to the implementation of co-operative learning strategies (See "A Place for Co-operative Learning")

B. Students then formulate a hypothesis: "*In light of what we know about acid rain, we think that ... because ...*". Based on this hypothesis, they make predictions as to the level of acidity they expect to find in their region during the data gathering phase of the project. These

A Place for Co-operative Learning

The project offers a ready-made WebQuest teachers can implement in their class. [4] [5]

It was designed with co-operative learning in mind and task interdependency has been consciously built into it.

- Students work as members of a **primary team**. The mission of the primary team is to produce a newspaper article addressing a pre-defined number of issues on the question of Acid Rain. Each team member is responsible for completing part of the task, i.e. research and write-up on one issue.
- Each student is also part of a **secondary team** of experts on one issue. The mission of this group is to develop a thorough understanding of the issue, to come to a shared understanding which will be brought back and used by the primary group.
- When the primary group reconvenes, the various experts have all the elements required to complete the task. They must do more than just write their section of the article. They need to convey their understanding of each issue to the members of the team so that, together, they can agree on the introduction as well as the conclusion.

results are communicated to the partner classes.

C. They also learn the basic skills required for the measuring acidity and for collecting precipitation samples.

4 - The experiment: our data, our analysis

The class collects precipitation samples over a period of time to check the validity of their predictions and to test their hypothesis. This requires:

- Building a precipitation (rain, snow, …) collection station
- Collecting and recording data
- Sending data to all participants
- Analysing local data and that of others in light of the hypothesis.
- Sharing analysis with members of the team… other classes.

5- So what? What we did with the understanding gained

Students decide what they could do with the understanding gained during this project. Planning and taking action plunges students in a real-life situation, where knowledge is gained for a purpose and where it must be used. This can also be used to highlight or measure the evolution of their understanding from the first brainstorm activity on. Moreover, each group documents and communicates to the others what actions they have chosen to implement.

The benefits for teachers

All QESN-RÉCIT Learn-By-Doing Projects, including Spring Acid Rain Watch, involve teachers from diverse backgrounds and experience who participate in a common task. This is possible in part because an experienced educator coordinates and supports participants. When considering whether to register for one of these projects, teachers should keep in mind the following:

- "Learn-by-Doing" projects are for teachers who have little or no experience with integrating communications technology in their teaching practices;
- They are also for teachers who feel comfortable with technology but who are looking for a more natural integration or a better curricular fit;
- Teachers who are ready to try something new but wish to be accompanied along the way have often found that a "Learn-by-Doing" project is a good way to go;
- These projects offer them a helping hand to take another step in the right direction. [3]

[1] Spring Acid Rain Watch complete project description and registration form is available on the Web at http://www.qesnrecit.qc.ca/cc/acidrain

[2] The list "Learn-by-Doing" projects can be viewed at http://www.qesnrecit.qc.ca/cc/ldoann.htm. This list grows as the year progresses and more projects are offered.

[3] More about "Learn-by-Doing" projects on the QESN at http://www.qesnrecit.qc.ca/cc/learndo.htm

[4] "Acid Rain is still in the news: a co-operative learning WebQuest", http://www.qesnrecit.qc.ca/cc/acidrain/webquest/index.htm

[5] To find out more about WebQuests, visit http://www.qesnrecit.qc.ca/cc/inclass/webquest.htm

A place for technology

The QEP considers Information and Communications Technology (ICT) as an absolute requirement. However, how to build it into a project in a meaningful way is not always obvious.

In this project ICT falls into place quite naturally.

- Classes communicate with their partners to share their data, their analysis, their understanding and their actions. Current knowledge and thinking are enriched at every step by the input from the other classes. Communication is the only way to get the essential data required to test the hypothesis. All this is done through a simple Web-based bulletin board, but could be done by Email also.
- Current information on Acid Rain, its effect on the environment and on our health, the latest data on emissions, governmental action, etc., this type of information cannot easily be found in the average school library. Access to the Internet as a source of documentary information is a must.

  Note: The Spring Acid Rain Watch web site is the primary source of information, resources and suggestions for participating teachers, while support and guidance is given mainly through E-mail by the project co-ordinator. Thus the project itself models how the Internet is both a communication tool and a source of valuable information.