

Before even starting to discuss teaching Science and Technology in elementary school, it is necessary to ensure that everyone shares a common vision for certain common elements related to the discipline. The document entitled *My initial ideas* may be used as a tool to come to this understanding.

This tool may even be used several times when accompanying the same team. This may prove to be an interesting exercise for noting the evolution of concepts around the proposed themes. In that case, we suggest that you use a paper colour that is easy to find among other documents. The Centre de développement pédagogique pour la formation générale en science et technologie (CDP) uses yellow paper.

#### Training intentions

- Enable the participants to produce a shared representation of concepts in Science and Technology.
- Enable the participants to begin a thought process about the contribution of teaching Science and Technology in elementary school.

#### Animation suggestions

##### 1. Individual thought process

We initially suggest that the participants begin an individual thought process about the three elements written on the front of the page. This page may be completed by stating additional instructions like the examples below.

- In the *for me science is...* section,
  - Suggest that they express a definition that may be given to students.
  - Ask for counter-examples.
- In the *for me technology is...* section,
  - Ask for examples.
  - Suggest that they give example that a student would understand.
  - Ask for counter-examples.
  - Ask them to make associations between Science and Technology.
- In the *For me, teaching Science and Technology in elementary school is...* section,
  - You may ask them to define what teaching this discipline means to them;
  - But you may also ask them to express emotions and related sentiments;
  - You may also ask about the advantages and disadvantages of teaching this discipline;
  - It is important to remember to ask the participants' opinion about the usefulness of teaching Science and Technology in elementary school.

**My initial ideas**

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**For me, science is...**

**For me, technology is...**

**For me, teaching science and technology in elementary school is...**

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## 2. Sharing ideas and points of view

Next, it is important to have a round table discussion. If, for lack of time, you must choose between individual reflection and a group discussion, the latter should take preference. The participants can then state their ideas and learn about their colleagues' point of view. Often, participants will present a considerable number of key elements associated to the concepts that are science, technology and the teaching thereof.

## 3. Summarise, and give or suggest one or more definitions

To follow up on everything that was said or stated, it is essential to summarise the proposals put forth by the team. At that time, bring out the elements that will enable you to give a common definition. This part must be carried out with tact and it is important not to suggest definitions that are more like dogma. You must take into account that the team will need to use these definitions with students between 4 or 5 and 12 years old.

Here are some elements which may be brought to the attention of the team, or highlighted if the participants have already brought them up. This list is not exhaustive and the person responsible for the animation of this activity is also invited to present their point of view.

- About science
  - There is a huge variety of definitions for the word science. You must therefore remind the participants of the context (elementary school).
  - Science is one of the ways man has given himself to understand the world in which he lives.
  - Other than science, other means that are used to explain natural phenomena are: the fantastic (magic) religions, philosophy, etc.
  - One of the indisputable characteristics of science is verification by experimental methods. In children's words, it could be said of science that *asking nature a question* and, if the question is correctly asked, observation or experimentation will allow nature to answer back.<sup>1</sup>
  - The knowledge of a scientific nature is not dogma. It is possible and relatively frequent to see scientific knowledge evolve.
  
- About technology
  - Technology is directly related to certain needs. You may then review Maslow's pyramid and have people notice that at the base, there are basic needs (to be housed, protected, fed, move about) before getting to needs related to high tech (entertainment).
  - Technological fields (AST program, page 28): agricultural and food technologies, transportation, construction or energy technology, medical, production, information and communication technologies.
  - With Science and Technology in elementary and high school, technology is associated to the processes of design and analysis of an object. Eventually, the repair and maintenance of objects is also broached.
  - Technology is not always related to an object or mechanism (e.g. making yoghurt).

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<sup>1</sup> This expression is inspired by an interview about the French program *La main à la pâte* with Georges Charpak on the radio program *Les années lumières* on la Première Chaîne de Radio-Canada (February 19, 2006).

- About associations between Science and Technology
  - Science and Technology feed off each other. Advancements in one push the limits of the other. In partnership, they allow man to come to terms with his world and to respond to his needs.
  - In some fields, it is difficult to distinguish between Science and Technology. For example, if a team is working towards designing a new drug, researchers use both science (biochemistry) and technology (pharmacology).
  
- About teaching Science and Technology in elementary school
  - Some elements drawn from the Science and Technology program:
    - *This program constitutes an initiation to scientific and technological activities (p.144)*
    - *“...the program aims to develop the scientific and technological culture in the student.” (p.144)*
    - *“Using simple observations and manipulations, he addresses various problems using instruments, tools or techniques adapted to the situation.” (p. 150)*
  - Teaching Science and Technology is centered on the initiation to science and technology. It is by implementing the general learning process in science and Technology that the child may understand the work of a researcher or a technologist or an engineer.
  - Teaching science and Technology should enable the student to “perform” science rather than simply talking or reading about it.
  - As far as the usefulness of teaching science and Technology, you may talk about children’s interest in science and technology, of their lack of interest in the trades, careers and professions in this field and of the potential in these fields.
  - Boys’ motivation for school may be mentioned.
  - Stereotypes, such as the low rate of girls in sciences and engineering, may also be mentioned.

#### 4. The place of Language Arts in Science and Technology in elementary school

For me, the place of Language Arts in science and technology in elementary school is...

For me, the place of Mathematics in science and technology in elementary school is...

The back of the sheet may be used at the time you judge appropriate. Each participant can note their vision for the place of Language Arts in science and Technology in elementary school and share it with the group afterwards.

You may also want to discuss the place of science and Technology in language arts in elementary school.

Science and Technology and Language Arts may be considered inter-dependent disciplines. Though science and Technology is a discipline with its own language, the student will need to use English for reading, writing and the spoken word. Thus, when you work in science and Technology, even during experiments, it is of value to seize the opportunity to build on the various competencies in language arts.

In addition, the discipline of science and Technology offers many opportunities for working on Language Arts competencies differently. There are frequent referrals to types of writing that are not often exploited in regular Language Arts teaching:

descriptive texts, explanatory texts, how-to texts and texts that illustrate information or ideas.

The relationships between these two programs are thus numerous and where it is pertinent, the activities produced by the CDP for general training in science and technology will suggest avenues to exploit them.

### **5. The place of Mathematics in Science and Technology in elementary school**

Mathematics and science and Technology are a part of the same field of learning. The relationships between the two disciplines are many. With the *My initial ideas* activity, the teachers are invited to explore them.

During the animation, many elements will establish the relationships between these two disciplines. Here are some examples:

- **Measurement:** All the measurements that are required learning in the math program can be worked on concretely and in real-life contexts during activities and LESs in science and Technology.
- **Statistics:** During activities and LESs in science and Technology, many statistical tools may be applied in a context that is concrete and pertinent to the students. Tables, bar diagrams, and broken line diagrams are the most frequently used tools. We will sometimes also use averages.
- **Geometry:** In technology, geometry will allow objects on or with which the students will work, to be represented, when a technological analysis or design activity is undertaken.

As is the case with language arts, the activities and LESs proposed by the CDP will suggest avenues to exploit the interdisciplinary avenues in math, Science and Technology.

## Complementary references

**MELS**, *Quebec Education Program – preschool and elementary education (QEP) chapter 6.2, Science and Technology* pages 143 to 161, 2001

An interview by Chantal Srivastava about the French program *La main à la pâte* with **Georges Charpak** on the radio program *Les années lumières* on la Première Chaîne de Radio-Canada (February 19, 2006).

**Thouin, Marcel**, *Notions de culture scientifique et technologique : concepts de base, percées historiques et conceptions fréquentes*, Éditions Multimondes, Sainte-Foy, 2001.

- Chapitre 1 – L'épistémologie : pages 7 à 22

And for those who wish to go even further:

**Riopel, Martin**, *Épistémologie et enseignement des sciences*, Web site, last updated June 4th, 2013 (in French)

<https://sites.google.com/site/epistemologieenseignement/>

## Thanks to :

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