

## Comment

# What is a scientist's job? From the drawings to the citizenship

**Etienne Bolmont**

The contribution of the IUFM of Lorraine to the SEDEC project basically starts from a reflection on the implications resulting in terms of education from the links between science and European citizenship. This process raises two main questions:

- What are the relations between science and citizenship; how to make them emerge and how to use them in a class context?
- What are the relations between science and European citizenship; how to take the European dimension into account?

We tried to give practical answers to these questions through two activities to be performed in primary school classes. Our approach, which is defined in the official directions for the science and technology program, is based on a four-step investigation:

- Defining the problem: “What is a scientist's job?”
- Allowing the children to express themselves according to their knowledge and ideas and to compare their views
- Validating or not their ideas through a twofold investigation:
  - Thanks to a historical documentation, pupils can compare their starting ideas with the contributions of the history of sciences;
  - Pupils meet some scientists who operate in the relevant field and can truly understand their job.

Drawing up a written report on the whole process.

The first principle to be complied with is to include in the process some occasions on which pupils can freely debate the issues resulting from the examination of the subject submitted to their attention. During these debates, children must introduce and support their ideas by resorting to suitable arguments, but they must also understand and accept others' ideas through constructive criticism. In this way, we build the pupils' citizenship so that they become ready to acquire a critical spirit, which is essential in the field of sciences, but also in the social context. The process continues with a comparison of the various views expressed by pupils on a scientist's job, the review of historical documentation, the preparation of a survey for scientists, and the analysis of the results obtained from the survey. This debate-oriented approach is not easy for primary school pupils. It must be practised on various occasions and in other disciplines. Moreover, it requires a favourable environment, where opinions can be expressed quite freely, pupils “dare” to express their opinions even when they are not sure about the “truth” of their words, and others' criticism is acceptable.

The second principle to be complied with is to introduce in the activities some European cultural elements in order to make pupils understand, through an overview of the history of sciences in Europe, that the issues to which their attention is drawn are similar in all European countries, or that a shared culture exists. At any rate, this process should never be aimed at limiting the scientific problem to a European dimension because sciences can only be regarded as universal if we do not want to be an easy prey to scientific nationalism. Hence, the goal is not to think in terms of European science, which is the risk resulting from a comparison with the history of sciences, but to consider the issues under examination without stopping at the borders of any country, at least by regarding them as issues shared by the various European countries. Therefore, the European context serves the purpose of characterising them.

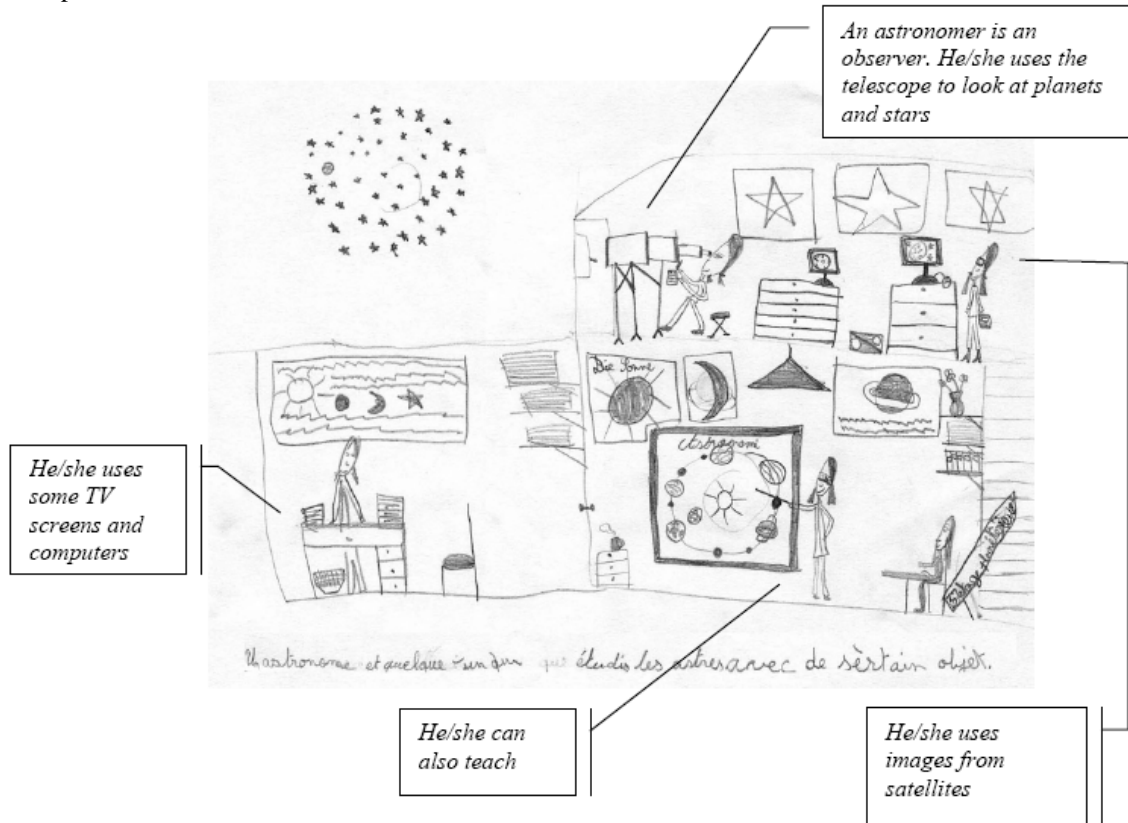
Within the framework of the SEDEC research program, we decided to refer our work to some elements of the database obtained from the survey on the perception of sciences in Europe. The views expressed by pupils on a scientist's job are quite interesting because they show that pupils have relatively stereotyped ideas. We used the drawings made by pupils during our research to compare French children's ideas to those expressed by other children.

**Astronomers**

The first experience was made with a primary school class of 10-year old pupils starting from the following questions: “What is an astronomer’s job? What are his/her tools?” Pupils were asked to draw their answers. Thereafter, they collected their drawings and divided them into categories. The prevailing ideas are as follows.

An astronomer is a space traveller, who visits various planets and picks up some samples. Sometimes, he/she is a tourist! This idea stresses the confusion between the astronomer and the astronaut.

Relying on a drawing made by one of the pupils, we can summarise some other ideas emerged from this experience:



Thereafter, pupils were shown the drawings made by other European children, which often supported their ideas. Pupils have very similar ideas:



These drawings made by Italian and Polish children give some additional contributions, such as the last one that stresses the importance of teamwork and note taking.

At this point, we may ask ourselves what pupils know. Their written representations show a multitude of ideas; hence, the recognition of the scientific status of this job (bold words):

*He/she performs some **research activities** on the space*

*He/she **observes** stars, planets, heavenly bodies, anything that is in the sky.*

*He/she **discovers** new galaxies.*

*He/she **monitors** the planet "operation".*

*He/she **studies** what is wrong, what is right..., what (the planet under examination) is made of.*

*He/she **looks** at another planet to check whether life is possible there.*

*He/she wishes to **demonstrate** that water exists.*

*He/she **reflects**. He/she tries to make improvements.*

*He/she **takes some written notes**.*

And what about history? We suggested them to go through the centuries, especially in order to discover the evolution of the tools used by astronomers.

Copernicus used some tools that were similar to those used by the Greeks:



In 1608, Galileo devised his telescope, which was then improved until the 20<sup>th</sup> century (here, in the 17<sup>th</sup> century, the Polish Hevelius). However, today, astronomers spend their time at a computer, instead of a telescope finder.

This step being completed, pupils still



had some questions left on an astronomer's job. Therefore, in order to answer those questions, we contacted three astronomers, two Polish astronomers and a French one, who at that time were working at the South Pole. Pupils prepared some questions. We chose the ones that referred to the astronomer's job:

- *Why did you choose this job?*
- *Is it hard to become (and remain) an astronomer?*
- *Where do you work? In a laboratory? In a planetarium? Outdoor?*
- *Do you work by yourself or with a team? Does everybody do the same thing?*
- *What is the equipment of your laboratory?*
- *How do you "control a satellite from your computer"?*
- *What are computers intended for?*

They were astonished by some answers. All scientists made reference to an early vocation. Pupils were also worried by the difficulty in becoming astronomer: studies are very long and there is a lot of math...

In the end, this process was strongly motivating for their astronomy program. Pupils became curious and, most of all, they gained a better understanding of the activities performed by scientists.

## Botanists

We applied the same approach used for the astronomer's job to the botanist's job and asked the question: "What is a botanist's job?"

This experience was totally different because we had two communicating classes close to Nancy, and the citizenship dimension was developed through the exchange between them.

Pupils exchanged their drawings and the conclusions they reached in their classes. First their personal ideas appeared, and then they modified them following the exchange.

Thereafter, they were shown the drawings made by other European children from the SEDEC database, they debated the various contributions, and they were made aware of the historical evolution of this science through a slide projection. The conclusions drawn in one class were also shared with the other one.

At that time, they had not a precise idea of the botanist's job, even though they made their ideas evolve. At the beginning, they confusingly thought that a botanist could be a florist or a gardener. The contacts with a researcher from the University of Nancy, as well as the visits to a laboratory and a botanic garden enabled them to gain a much more precise idea of the botanist's job. The two classes met on those occasions and these events made the pedagogical experience richer.

The debate between two classes is much easier to be triggered than that within a single class, where often pupils do not dare to express frankly. In this way, we could avoid the relational problems that may arise within a class when some pupils are challenged by their schoolmates.

## Conclusions and perspectives

During these two experiences, pupils improved their **citizenship** thanks to a scientific activity basically performed through debates within the some class or with another class.

We tried to raise their awareness of the **European citizenship** through

- the comparison with drawings made European pupils,
- an overview of the history of sciences in Europe, and

exchanges with European scientists.

The design of the second experience gives children the opportunity to **live their European citizenship** through communication between two European classes.

And this is the project that we would like to implement starting from the beginning of the academic year 2007.

*Translated by Rossella Bagnardi*

## Author

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