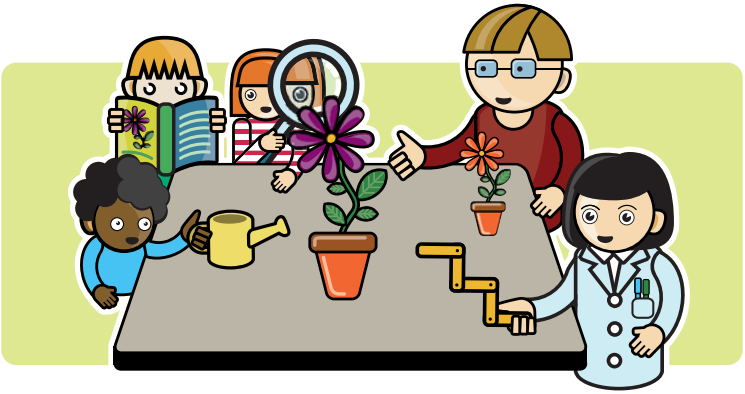
Supporting teachers in the classroom



What does this consist in?

Professional scientists or scientists in training, support science students (from universities and engineering schools), research scientists, engineers, whether currently working or retired, take part in the classroom sessions devoted to science and technology.

The scientific tutor commits himself to regularly take part in classes, one half day a week, for a period of at least seven weeks between two school holidays in order to give his mission a certain continuity. His contribution is resolutely part of an investigative approach.

During preparation, the scientific tutor advises the teacher on the scientific notions targeted by the class activities. At the teacher's request, he explains them, underlining the relation with other notions dealt with in previous classes and linking them with certain everyday situations. He also helps set up the sessions by suggesting equipment, experiments and providing documentation.

Implementation in class is an opportunity for the scientific tutor to assist the teacher, to guide the pupils through the investigative approach, to stimulate expression and reasoning and to question them. To this end, the scientific tutor actively participates in exchanges. A posteriori, he analyses the organisation of the activities with the teacher. Each contributes his skills, scientific expertise on the one hand and pedagogical know-how on the other, in order to adjust appropriately the forms of Teacher Support. As he is concerned in making the teacher more

autonumous, he also helps the teacher identify key moments in the investigation process which the latter can then use in the future to set up other learning situations... He takes great care not to take the place of the teacher who remains solely responsible for the learning process.

Testimony

The quality of the relationship between the teacher and scientist influences whether the project is successful or not and if it is to the benefit of all the parties involved. Thus I have observed the confidence and ease acquired by the teacher. This enables him, after the scientific tutor is gone, to continue teaching science and deal with scientific questions and remarks from pupils and sometimes to extend the approach to other areas of science. Making the teacher autonomous is really a key goal for the scientific tutor.

***Camille Charaudeau**, scientific tutor*

Moreover, the presence of a scientist in the classroom creates an original pedagogical situation: the diversity and richness of possible interactions between the teacher, the scientist and the students inspires new ways of learning as the past experience of engineering students from the ESPCI has shown.

Testimony

At the ESPCI (City of Paris Industrial Physics and Chemistry Higher Educational Institution) engineering students have provided Teacher Support in science and technologies in neighbouring schools since January 2000. A study was carried out on the new situation created in the classroom by the presence of a scientific student. It shows that Teacher Support in science is not a form of "aid" for teaching science. In this new pedagogical context multiple interactions immediately take place between the teacher, scientific tutor and students. The roles and skills, which are different yet complementary, seem to favour an interface that promotes knowledge rather than the execution of a task. It is not only the teacher and/or scientific tutor who make it possible for the pupils to learn, but the whole situation and space that makes other learning processes possible.

***M.O. Lafosse-Marin**, Espace des Sciences Pierre-Gilles de Gennes*

Some characteristics of Teacher Support in the classroom

A day in the life of a full-time scientific tutor provides a perfect illustration of all the different aspects involved:

Before the session

Ilsabelle, a CP teacher (6 to 7-year olds) would like to work on the theme of Air. As I have already dealt with this subject with pupils in CE2 (8 to 9 year-olds) I can tell her about the difficulties I encountered: air is invisible and therefore does not exist in the pupils' minds. It is not easy to organise sessions on a subject that you don't know very well yourself...I help Isabelle recap the fundamental notions involved and we discuss the target we want to achieve: awareness of the physical existence of air.

Scientific guide
Teachers do not always master the subjects concerned. The scientific tutor can help overcome certain difficulties.

We agree on the content of the first session: we will have the students handle bags containing different materials, including one "empty" one, or rather a bag full of air...Our aim is to start them thinking about air. Isabelle will take care of the bags and their contents while I will provide cardboard boxes to hide the bags.

Contribution to logistics
Equipment and documents. Sometimes it is necessary to improvise.

During the session

The following Thursday we have a set of bags for 24 pupils. Isabelle is going to supervise the handling of the bags while I help the pupils with drawings and writing about their impressions.

A second adult in the classroom
With two adults it is easier to supervise all of the pupils during an activity.

Isabelle starts a discussion with the entire class: what were in the bags? How do we know? Isabelle glances at me from time to time. I jump in when she hesitates: No, wind and air are not the same; we'll talk about that later in one of the lessons.

New possibilities
By his presence alone, the scientific tutor encourages the teacher to experiment. The teacher can count on help from "the expert" when he is not sure of something.

We end the session with a summary dictated by the pupils that they will write down in their notebooks.

Working in tandem
To be more productive, knowledge must be shared between peers: the scientific tutor knows "how things work" while the teacher knows "how to teach".

After the session

I suggest that we adapt the module used with the CE2 class and help Isabelle select some experiments she has found in a pedagogical book. I advise against using some of them as they are too complicated to understand or explain.

Finally, we plan to progress over 6 or 7 sessions with a few supplements that Isabelle will do alone with the class over the week. We've been talking for over an hour already! We say goodbye and plan to meet next week for the second session...

Contribution to the substainability the approach
The teacher sets up, with help from the scientific tutor, the steps of a learning process which is organised around a series of sessions.

***Estelle Comment**, Student at the Ecole Polytechnique, scientific tutor in a primary school during her internship in Personal Development*

A few guidelines for effective support

In order for everyone to fully benefit from in-class Teacher Support (pupils, teachers and scientists) there are a few necessary administrative, scientific, pedagogical or relations-related steps before, during and after the sessions that the scientist and teacher should devote some time to.

The relationship between the teacher and scientific tutor

The scientific tutor can benefit a great deal from an initial contact with the class during school hours in order to get a feel of the atmosphere, understand the habits of school life and work methods, get acquainted with the pupils, arouse their curiosity and have a preliminary contact with the teacher before the first Teacher Support session.

As for the teacher, he will make sure the curricula are followed by informing the scientific tutor of course content and objectives in science and technology for the class concerned. He will set up favourable conditions for the inquiry-based approach and teach the pupils.

He will also take care to facilitate the smooth integration of the scientist in the class, whether in terms of his relationship with the pupils or the school, by taking care of any behavioural or disciplinary problems in the classroom.

Creating classes and activities in tandem

Since preparation is essential, it is necessary to provide time before the sessions. This can sometimes be a problem: primary school teachers don't have many gaps in their schedules and can also help in the canteen at lunchtime or supervise study hall after classes.

Key points to cover

- the period in the school year and the duration of the Teacher Support project, drawing up a calendar if need be;
- the context of the work done: is it a school project, part of a cycle, a class project?
- an explanation of the notions of the programme to be covered and the target scientific concepts.

These should be limited in number as it will be a first approach for many pupils.

- the distribution of tasks required for the preparation of the project (equipment, research, documents...);
- the experiments to be carried out and tested before use in class.

Giving meaning to pupils' knowledge

The scientist will take care to:

- help pupils express in multiple ways the knowledge they have acquired in order to guarantee they have assimilated it;
- put their knowledge in perspective by showing them that it can be applied to many different situations in everyday life;
- demonstrate the cultural and social dimensions of science through the discovery of different professions and places where science is carried out (important national institutions, museums, associations, centres for scientific, technological and industrial culture, local governments, universities...) which can often arouse children's interest in science.

Analysing, *a posteriori*, class practices

During the course of the project adjustments often need to be made. Analysis and evaluation are easier if, at the outset, some means are set up to record the work done on both an individual level (experiment notebook, file...) and collectively (posters, tables, organisation charts, videos...). A grid is available in Appendix 3 that will enable the scientific tutor and teacher to evaluate their work in relation to the principles outlined in this chapter.

Pitfalls to avoid, hurdles to overcome

Nothing is as simple as it seems!
The role of the scientific tutor is a subtle one. He must act in the classroom without taking charge, answer questions without giving too many answers... All these difficulties can lead to problems, among the most frequent:

Taking the teacher's place

This goes against the principle of joint-intervention in class: the teacher must remain in charge of the class and implement the pedagogical programme so that he can organise the activities alone later on, after the scientific tutor has left.

Giving all the answers

The scientific tutor creates an unfortunate situation by positioning himself as "the one who knows" and the opposite of "the one who receives". It is much more interesting to develop the child's tendency to search for the answer himself, through experimentation, analysis and thought, according to the principle of co-production of knowledge.

Showing a form of science that is inaccessible, reserved for experts

The level of conceptualisation must be carefully selected so that the subjects treated in the classroom are adapted to the children's ability to understand. Children should be made curious about science and their environment and not confronted with concepts that are too difficult, leading them to believe that science is not for them, even if their questions often spontaneously concern technological objects or complex phenomena.

Knowing everything and doubting nothing

Such an attitude gives children the wrong idea about science since it is through trial and error that science in fact makes progress. Contrary to what many children believe, scientists do not know everything and can make mistakes. Moreover, it is always useful to ask children to express their ideas before checking or refuting them as this is part of the knowledge building process.

Making oneself indispensable for the scientific activities in class

The ultimate goal of Teacher Support is to help the teacher achieve a sufficient level of autonomy. Therefore the scientific tutor should take great care not to make his presence indispensible for the success of scientific activities.

Testimony

I have been able to take part in Teacher Support in CP-CE1 classes (6 to 8-year olds) for several years for 5 or 6 sessions per semester. The subject chosen is linked to the themes of the year (water, the atmosphere, the climate, etc...) and the content of each session is carefully planned with the teacher. The main difficulty has been to adapt to the rules of discipline and the inventive and exuberant behaviour of young children during experiments. It has never been difficult to show that an experiment that didn't work was just as demonstrative as one that had. A lot of time is always spent on the presentation and collective discussion of results and the writing up at home of reports has enabled us to involve all the pupils, especially those that tended to stay on the sidelines during the sessions.

***Jean Matricon**, Professor Emeritus at the University of Paris 7*

Scientific tutor student from Polytechnique in a 8 years old class in St-Etienne working on the body in movement.

Doctoral student in a class at Loire-Atlantique.