

# Adversity in life, sharing science

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- Be at school with a disability
- Make science accessible to outsiders

B. Blossier: Repères IREM, Vol 84, p 19 (2011)

B. Blossier: acte du colloque OPHRIS “Pratiques inclusives et Savoirs scolaires”, p 189 (2013)

N. Audoin *et al*: Ministère de l'Education nationale, [eduscol.education.fr/ash-ressources-disciplinaires](http://eduscol.education.fr/ash-ressources-disciplinaires)

M.-H. Heitz and E. Saliel: Grand N, Vol 95 (2015)

B. Blossier *et al*, Bulletin de l'Union des Physiciens, Vol 109 (2015)

# Be at school with a disability

## Who am I?

2000-2003	Graduate studies at Ecole Normale Supérieure of Paris
2003-2006	PhD thesis in Laboratoire de Physique Théorique d'Orsay
2006-2008	Post-doc at DESY Zeuthen
since 2009	Associate researcher at CNRS

Research activities in particle physics: flavour physics and lattice QCD

[B. B., "Strong decay of the scalar  $B$  meson", poster presented at EPS-HEP 2015].

Not familiar with science of education, even less with the question of pedagogical accessibility, except my daily life as a visually impaired person; lectures only given to students finishing their master or doing their PhD.

Severe to deep visual impairment caused by the Peters Syndrome: cornea opaqueness, nystagmus, high pressure within eyes, glaucoma, retinal detachment. Very strong myopia, tubular vision, recent appearance of a scotoma, but work on usual supports still possible; far vision quite comfortable thanks to a monocular until 2014. Locomotion in an external environment more and more hesitant, close to use a blind cane.

## Schooling achievement of a young disabled pupil

- a favorable family environment
- take care to satisfy the curiosity need expressed by the child
- early immersion of the kid in an ordinary (unprotected) environment
- try equipment helping the schooling in an ordinary establishment and changes brought very fast in case of failure
- teachers must individualize their teaching if needed

## Schooling achievement of a disabled teenager in high school

- use in a smart way compensating means of different kinds
- at a first stage, continue to individualize punctually the teaching, but tend to diminish it if it is too stigmatizing
- later, encourage the pupil to take initiatives with a "demanding caring" by the teaching team
- pay a particular attention to the choice made by the pupil in future studies

## Valuable course of a disabled student at the University

- easy access to pedagogical resources: filmed lectures, typed notes given well in advance, digitized books (voice synthesis, e-learning)
- prepare in advance tutorials: get used to make write-up, whatever the medium

# Make science accessible to outsiders

## Train teachers

In France, the so-called "law of 11th February 2005" setting the framework to fulfill the citizenship of disabled people, must have as a corollary some initiatives **improving for disabled pupils the benefit of their schooling**.

Employ human helpers or fund expensive devices are not enough: **let aware of the obstacles faced by any disabled pupil to pass the requirements of subjects taught**.

Ministry and parliament reports point that teachers are not sufficiently informed and trained about adapting the pedagogy of their lessons.

Reinforce **the autonomy** and **highlight the intellectual work that is provided**: two skills particularly sought by employers.

Prepare a **booklet** offering a couple of indications to teachers supposed to welcome in their classroom **sensory impaired pupils** or with **specific troubles in learning**.

Mathematics, Physics and Chemistry, Biology and Geology are discussed in the booklet

Different disabilities can be overcome by various pedagogical adaptations: a dyslexic pupil will prefer to work from schemes than from texts that have a high cognitive cost, it is better to use an inductive approach with deaf pupils due to their lexical poverty.

In function of the subject, different questions can be asked about the methods of teaching to disabled pupils:

– in **Mathematics**, how to learn **the space geometry** to a visually impaired kid?

– in **Experimental Science**, how to put disabled pupils in a good position to **be active in a small group** in the framework of an **investigation process**?

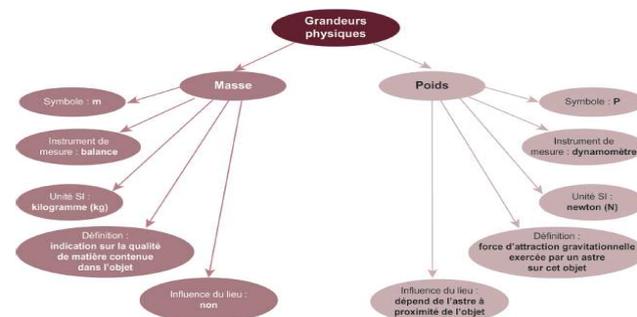
2 or 3 “sequences” per subject are selected thanks to the **quality of their building** and the **richness of their pedagogical content**.

The 7 years of "collège" and "lycée" are covered.

Sequences **really tested in classrooms**, as well as their adaptations.

In an introductory lesson of chemistry, clearly present the safety recommendations; dyslexic children memorize well the informations presented on a heuristic card.

Pictogrammes	Dangers	Précautions
	Danger de toxicité aiguë (tue)	Ne pas avaler, ne pas respirer les vapeurs et éviter tout contact avec la peau et les yeux
	Danger pour la santé (cancérigène...)	Mêmes précautions que ci-dessus.
	Danger pour la santé (empoisonne, irrite, allergisant)	Mêmes précautions que ci-dessus, mais le risque est moindre.
	Corrosif (ronge)	Ne pas respirer les vapeurs et éviter tout contact avec la peau et les yeux.
	Dangereux pour l'environnement (pollue le milieu aquatique)	Ne pas rejeter dans la nature; Éliminer le produit dans un centre de collecte.
	Gaz sous pression (explose, brûle)	Manipuler loin de toute source de chaleur (flamme, étincelle) et éviter les chocs.
	Danger d'explosion	Manipuler loin de toutes sources de chaleurs (flamme, étincelle, électricité) et éviter les chocs.
	Danger d'incendie (flambe)	Tenir à l'écart des sources de chaleur (feu, étincelles...).



After the booklet publication on <http://eduscol.education.fr/ash-ressources-disciplinaires>, propose activities to train teachers in a very practical way.

In physical science, Identify experts in pedagogical accessibility to build a network and train trainers is now the target: mutualize good practices.

## Let disabled kids do science in the framework "La Main à la Pâte"

Asking the question whether teaching science with the investigation approach can help pupils who face difficulties, G. Charpak, P. Léna and Y. Quéré answered that it is beneficial because it is based on the existence of a "tiers objet" (shadow of a character on the floor, puff of wind) that catalyze the questioning and generate a powerful mean of satisfying the curiosity of the kid. They were told that pupils with a motion or a mental disability were profiting of those lessons as well.

In 2010: decision to propose the framework "La Main à la Pâte" to establishments where a high number of disabled kids are in school. A well-defined protocole, teachers work together with scientists.

Pupils discovered science with sequences like "the Sun and us", "float or sink" or "the electric manege".



- Possible to organize the **work in small groups**, particularly positive: collaboration among pupils, sharing the tasks according to their abilities.
- **Handling** is an excellent factor to make pupils involved in the work, even if their disability was sometimes a real obstacle to properly handle the elements of an experiment.
- A **long-lasting learning**: one year or even two years after the work, pupils remember for instance the condition to let a light shine (closed electric circuit) or the role of the air to explain why an object is floatting.
- **Accept the "try/error" process**: pupils understand that an error in explaining a phenomenon, or to predict it, is not a failure, it is associated to the scientific approach. Because of their usual bad self-respect, a non negligible benefit.

– Conceptualization is as difficult for disabled pupils as for everybody. A convincing example is the position of the shadow with respect to the person.

Beginning of the lesson

disabled pupil

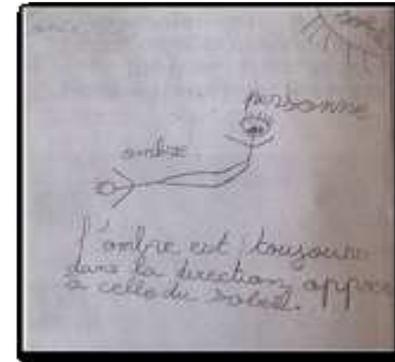


pupil w/o disability



End of the lesson

disabled pupil



pupil w/o disability



– Need to adapt the work. **Time factor**: sequences take typically twice longer than for pupils without disability. Specific equipments, rituals: pupils remember what they did last time, what they will do this time, to answer to which question and so on. Some of those adaptations are **efficient to other pupils**.

– **Thinking about the pedagogical accessibility proceeds like a zoom effect on learning troubles faced by almost every pupils.**