Training High School Teachers in Computer Science

A first experiment at University of Versailles St-Quentin

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Outline

Timeline

A very tight schedule

- March 2010 : UVSQ and Paris XI are contacted by Gilles Dowek.
- April 2010 : Initial discussion with the Versailles Academy DAFPEN (Délégation Académique à la Formation des Personnels de l'Éducation Nationale)
- June 2010 : Convention between UVSQ and DAFPEN signed.
- October 2010 : Training started at UVSQ (53/69 trainees). 45 will successfully pass the exams in may 2011.
- November 2010 : Textbook for teachers project launched.
- July 2011 : *Introduction à la science Informatique* is published (18 authors).
- October 2011 : Official TS program published [BO211].
- October 2011 : Training has started at UVSQ with 40 first year trainees and 40 second year trainees.

Training course

Initial objective

The initial objective

Achieve a bachelor level in Computer Science. At UVSQ this means $\approx 100 ECTS \approx 1000 h$ **for students**, so maybe secondary school teachers can do with less.

The program

- As proposed by G. Dowek, G. Berry, M. Nivat, J-P. Archambault : 72 days or 432h.
- As negociated with DAFPEN in 2010 : 36 days over 2 years (216h), starting with 18 days in 2010/2011
- As negociated with DAFPEN in 2011 : 28 days over 2 years (168h).
- Ministry of Education in 2011 : 60h of e-learning !!!

Training course

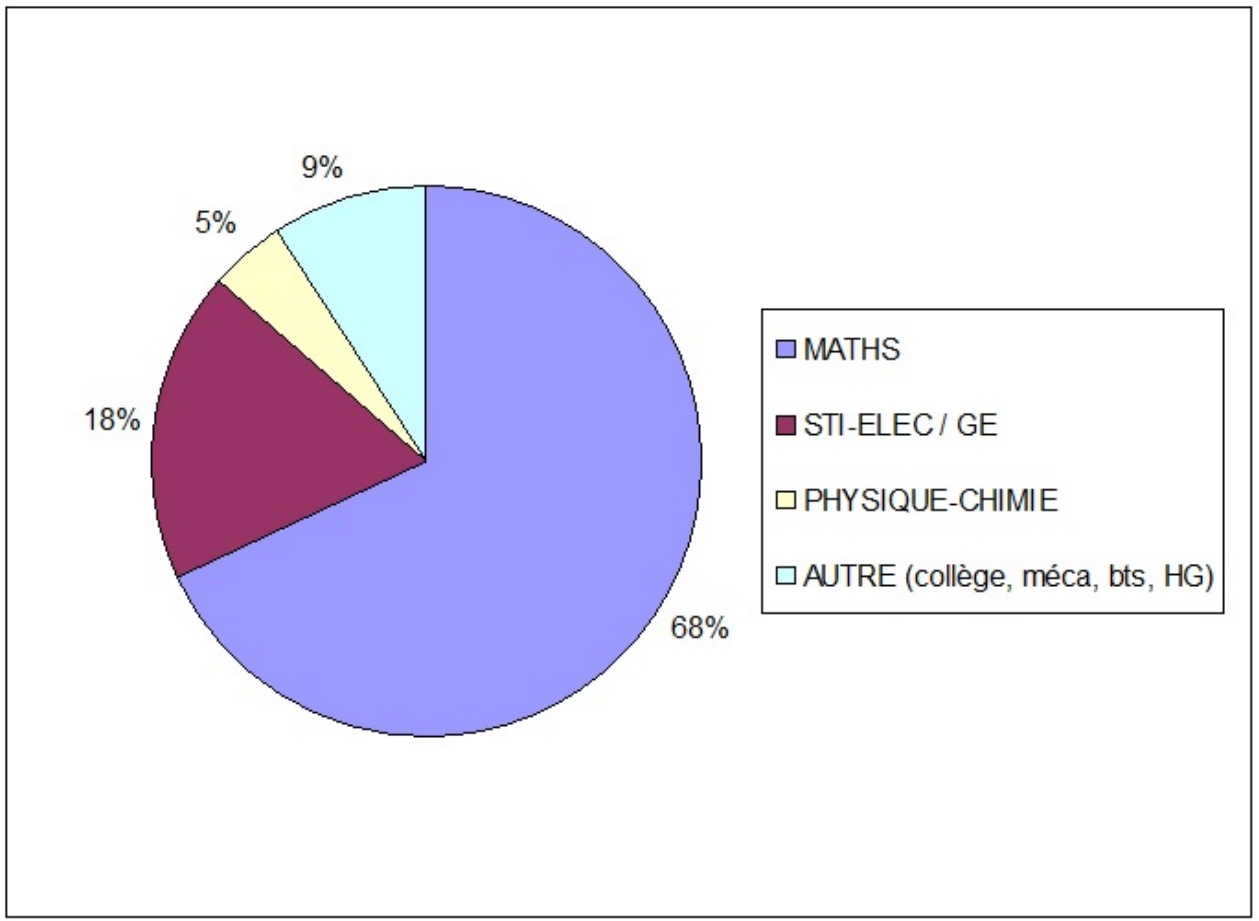
Current objective

Our current objective

- Achieve second year level (40ECTS or 400h).
- Help the teachers with course preparation. Try to give them *some sort of vision* about computer science (based on the official Terminale S course.)
- Create a network between teachers in high school and at university (see for instance **SIL:O! [SIL11]**).

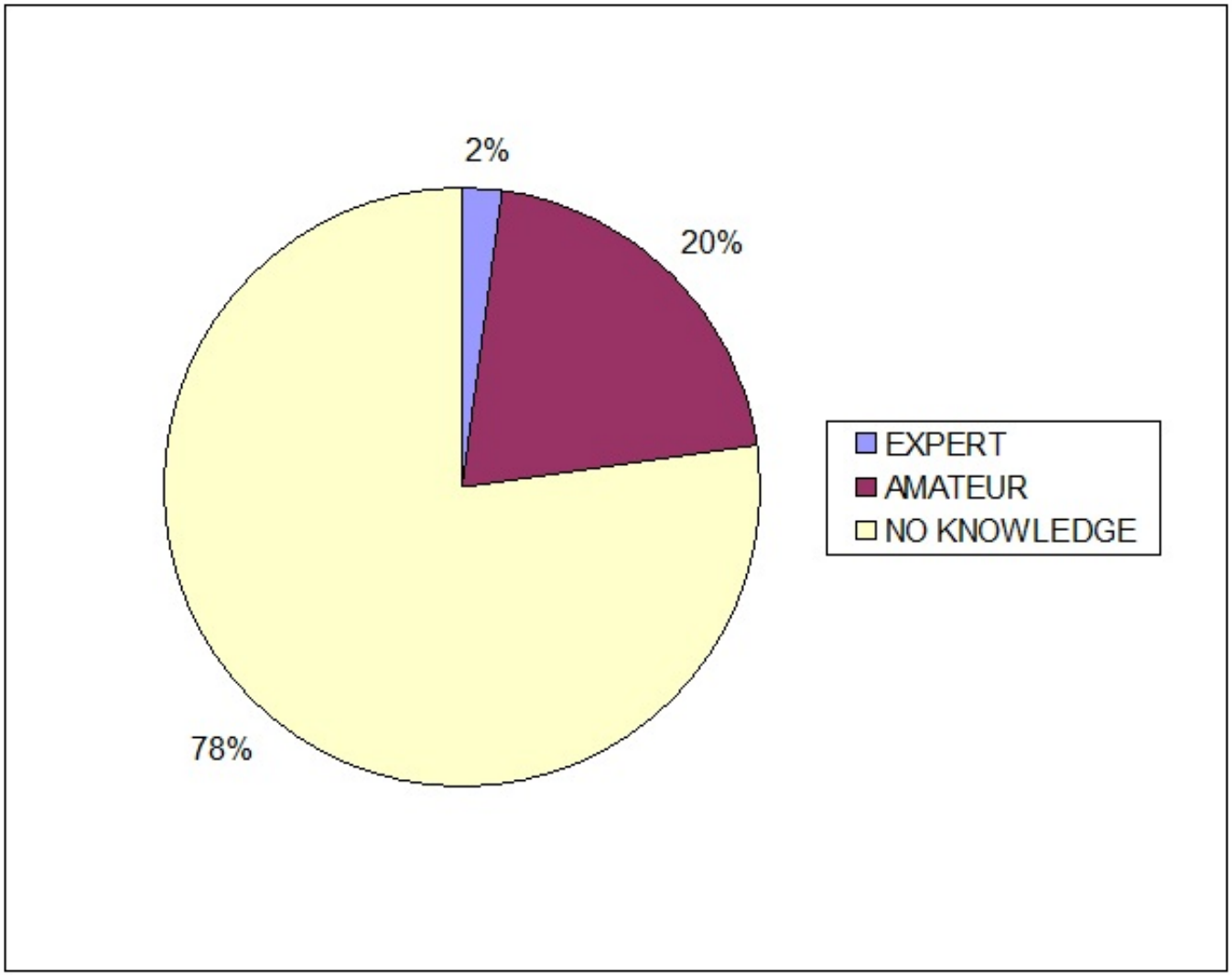
Background

Teaching Subject



Background

Previous expertise



Some problems

10% overall loss of trainees

Misinformation ?

- Trainees did not know what to expect (e.g. history teacher).
- Trainees were not aware of the length of the training.
- Trainees were not aware of the “difficulty” and investment needed of the training.
- Trainees need to be able to come at a set day (thuesday).
- Despite all our efforts, communicating with the EN administration is difficult (probably not a local problem).

Too hard ?

Trainees felt that a lot of “homework” was also needed, and claimed that it was asking too much of them. A large majority wanted a discharge of teaching hours.

Some problems

Who is going to teach ?

Training was on a volontary basis

- Many maths teachers, who are already overloaded with classes.
- Technology teachers, who are currently facing a reform ?

Teacher motivation is a key to pupil motivation

We hope that the new CS teachers will have chosen to do so !

The Trainers

UVSQ Staff

PRiSM Laboratory (INRIA-CNRS-UMR 8144)

PRiSM Laboratory topics cover all computer science topics except graphics, HMI, etc.

Topics and Trainers

- Programming (Franck Quessette & Benjamin Nguyen)
- Algorithmics (Thierry Mautor & Sandrine Vial)
- Architecture (Claude Timsit)
- Networks (Jalel Ben-Othman)
- *Databases* (Stéphane Lopes)

ISN High School Course[BO211]

October 2011 version

- Representation of Information (binary representation, Boolean operations, Digital representation of physical objects, formats, *compression*, information structure and organisation, information persistence on the Web, non-rival information)
- Algorithmics (sorts, *shortest path*, *algorithm* ***efficiency***)
- Languages and Programming (Types, functions, *debugging*, HTML)
- Architecture (basic components, *assembly language*)
- Networks (*point to point*, adressing, *routing*, network supranationality)
- *Robotics*

UVSQ material

Extra classes

- Discussion on programming language choice (C, java, CAML, . . .)
- University students take about 100h to become “ok” programmers. Trainees need to **practise** !
- Complexity.
- Databases.
- *Lessons*.
- Cross disciplinary seminars.

UVSQ material

Virtual Machine Environment

Lab work is based on the use of *virtual machines*. Each VM is set up for a given course.

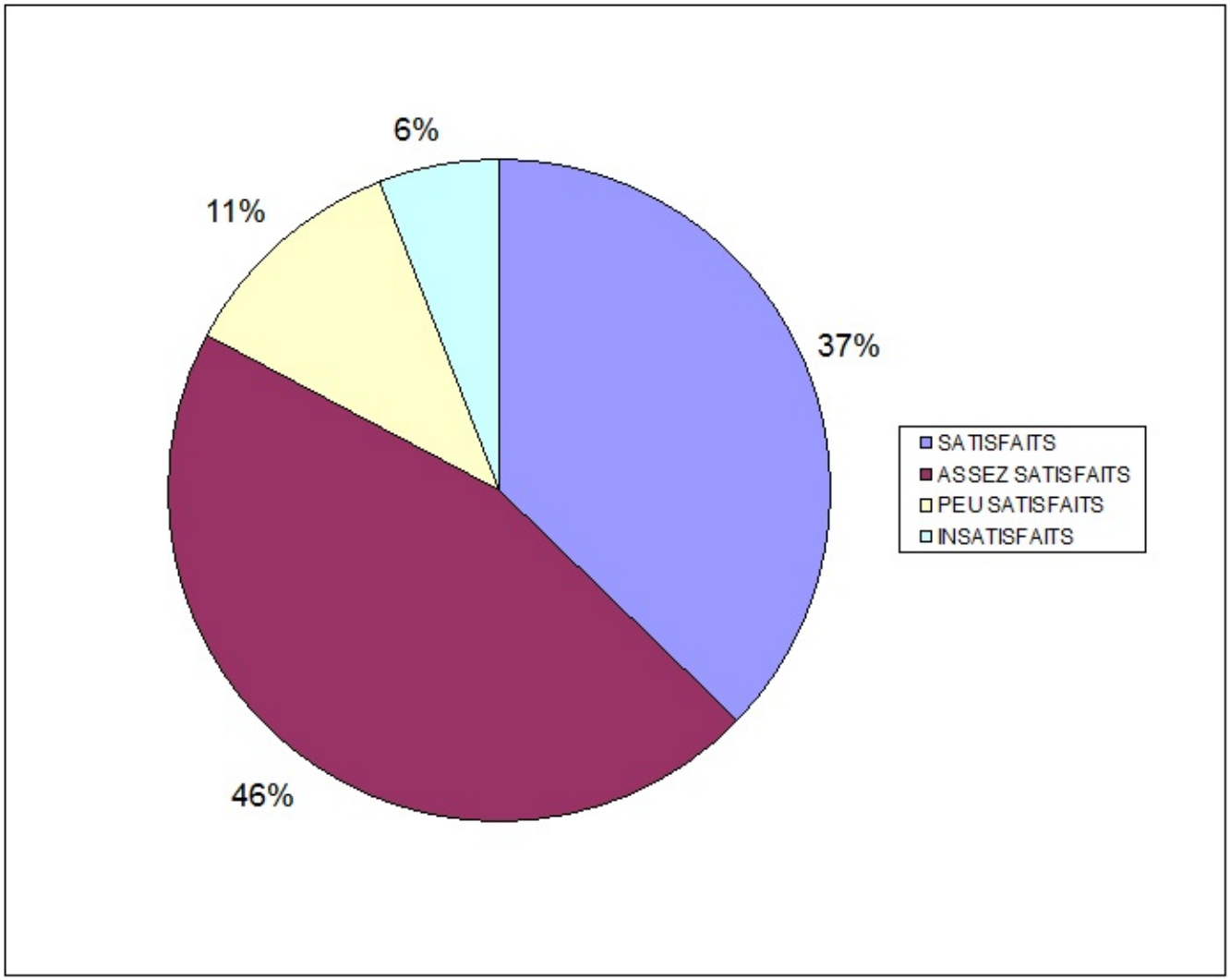
- Reduces time spent fixing wrong parameters.
- Can be handed out to trainees / students.
- Anyone can use it to perform lab work we propose *out of the box*.
- Free (We use VirtualBox[VM] by Oracle under GPL).
- **But** it requieres a more powerful computer.

Material availability

- UVSQ uses the *e-campus* *e*-learning platform on which we store our material[ISN10]
- Creative Commons license *Introduction à la science Informatique* by Dowek *et al.*[*11*].

Trainee assessment

Over 80% positive answers



Trainee assessment

Pros and Cons

Satisfaction

- Quality of the training.
- Availability of the trainers.

Dissatisfaction

- Too much work demanded, not enough time. Would like a discharge.
- Cover all the official program (which was not published at the time).
- Unequal level of trainees.

Certification

All the trainees present successfully passed the exams and will receive certification by the Versailles Academy upon completion of the second year.

Detailed assessment

Course

- On the aspects we covered of the official program, the trainees were satisfied.
- Not all aspects of the official program were covered (during the first yera), i.e. society and legal issues, robotics, HTML (we gave a general course on databases)
- No enough lab work. Not enough time to work at home
- **No preparation of *their* setting up of lab work !** This is arguably not our job.
- Contradictory assessment : many trainees wanted more classes, in particular more lab work, yet said that the course was too demanding time wise.
- The final exam !

Detailed assessment I

From the trainer point of view

- A great pleasure to work with High School teachers (compared to students. . .).
- Create a network of High School CS teachers. Participate at High School level.
- Not all trainees have the same background. This is a problem in particular for anything “theoretical”.
- Resources problem in Education.
  - Training cost (although we are very competitive !).
  - *e*-learning is pushed, but is not sufficient.
  - **Discharge cost for teachers**.
  - Cost for the University : most in-service training is much more expensive.
  - Not many exchanges with trainers outside our university (time problem?)

Detailed assessment II

From the trainer point of view

- Trainees were very demanding
  - Lots of questions during and out of class.
  - Lab work was different than with students, since the trainees wanted to be able to replay the exercises.
  - “Physical presence” of the trainers was essential.
- One-shot operation or a road to the creation of an *Agrégation* ?

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