

S-TEAM European project
What are the aims of WP4?
What do we have to do and how ?

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The three main objectives of the S-TEAM Project are:

- To improve motivation, learning and pupil attitudes in European science education, resulting in
 - increased scientific literacy and
 - recruitment to science-based careers, by:
- Enabling large numbers of teachers to adopt inquiry-based and other proven methods for more effective science teaching by:
- Supporting teachers by providing training in, and access to, innovative methods and research-based knowledge.

The nature of a support action such as S-TEAM means that measurement and verification of the objectives requires careful consideration. Concepts such as scientific literacy are controversial and therefore any attempt at measurement is itself dependent on agreed definitions. S-TEAM includes a work package (WP9) whose function is to identify suitable indicators, instruments and measurement techniques. A report will be produced by M6 which will define the terms of measurement and outline a long-term approach, using existing indicators where possible and appropriate.

1. An overview of the 10 Wps

S-TEAM is divided into ten work packages (WP). Achieving the aims of a support project such as S-TEAM requires a large number of individual actions, so the substantive work packages (2-8) will mainly work in parallel, with functional work packages (1, 9, 10) coordinating and evaluating the outputs of WPs 2-8.

- WP1 is concerned with the overall management of the project and will run throughout the three-year project period.
- WP2 will establish the initial parameters of the project in terms of existing policy. It will liaise with and build upon the work of *Mind the Gap*, but with the participation of a wider range of countries and institutions. It will also run throughout the project but the main focus of its effort will be during the first six months.
- WP3 will integrate the work of the German SINUS project into S-TEAM.
- WP4 is concerned with the role of teacher collaboration and also has the function of disseminating project outputs in France.
- WP5 concentrates on Initial Teacher Education and the preparation of training packages to enable new science teachers to adopt inquiry based methods.
- WP6 is concerned with the continuing professional development of science teachers, providing training packages to enable updating of skills or the introduction of innovative methods.
- WP7 provides specialist input in the field of argumentation within science teaching, producing teaching sequences which will help science teachers make better use of inquiry to develop scientific concepts and modes of thought in their students.
- WP8 provides specialist input in the field of scientific literacy, producing packages designed to stimulate teacher self-efficacy and the use of scientific literacy as a motivating concept.
- WP9 is concerned with the development and use of indicators and instruments. These have two main functions. Firstly, they will enable scientific evaluation of the project's own activities. Secondly, they will be used formatively by teacher educators, science teachers and students.
- WP10 will coordinate the project's dissemination activities, including the quality control of project outputs and overall media relations.

2. WP4: objectives and description of work

2.1- Objectives

Led by Université Pierre Mendès-France (UPMF), the objectives of WP4 are:

- To use existing empirical research on teachers' collective work as a basis for the systematic deployment of teacher collaboration in support of innovative methods in science teaching.
- To use teacher collaboration as a means of promoting equity and working with diversity in science classrooms

2.2- Description of work

As well as addressing the vital issue of teacher collaboration, WP4 has the central function of leading dissemination activities in France. WP4 is about enhancing teacher collaboration and collective work.

Inquiry-based methods introduce student cooperation, collaborative activities and uncertainty into classroom environments and teacher practices. Teachers need to work together to overcome this uncertainty and to develop new skills and practices. It is also important for teachers to collaborate in order to address issues of diversity and gender in the classroom, which have been identified as constraints on pupil attitudes to scientific literacy and science careers. Finally, projects such as SINUS have already succeeded on the basis of teacher collaboration, so there is an evidence base and a strong argument to pursue actions which encourage and support collaborative working. UPMF will liaise with IPN in WP3 regarding the collaborative aspects of SINUS.

WP4 will promote the role of teacher collaboration and collective work in implementing science education reform through teacher education. The four partners within WP4 all have proven expertise in teacher collaboration.

Drawing on its proven expertise and existing theoretical frameworks, UPMF as WP4 leader will work with UHB, CYCO (in WP6) and UnivStrath to produce models for the implementation of collaborative approaches, using video-aided reflection and other innovative methods.

2.3- Sub-packages

4.1 Dissemination strategy for France

As national liaison partner, UPMF will lead the production of a dissemination strategy for France, in cooperation with CNRS and UHB. This is necessary to enable large-scale dissemination within the French teacher education system which is currently transforming towards a model compatible with other European countries. In France, science teacher education is currently in transition from a quasi-centralized system (i.e. IUFM) to a distributed organization involving numerous universities. This situation requires a renewed articulation between teacher educators, schools and local authorities. Such a situation provides good opportunities for the dissemination of new practices amongst the actors of the science education system. Contacts have been established with other research teams (e.g. STEF-ENS-Cachan) or institution (e.g. INRP) which are well known for the efficacy of their dissemination strategy. A start up conference is planned for 20-22 October 2009 in Grenoble; pre-existing conferences will be used in M12 and M24 for dissemination in specific areas, (e.g. mathematics, biology, etc.); in M33 a final French national meeting will be held. A report will be provided for M12.

4.2 Teacher Collaboration guidelines: workbook for professional development programmes

A workbook is planned for M12. It aims to support collective reflection during workshops about the ways in which teacher collaboration could reinforce IBST, encourage positive consideration of learner's diversity and enhance pupils' learning outcomes (scientific knowledge, motivation, self-esteem, metacognition). A specific chapter will tackle teacher engagement/commitment and its effects on teaching approaches and practices.

4.3 DVD of case study materials on teacher collaboration in IBST/E

This sub-package is led by CNRS and UPMF. The DVD is planned for M18. It addresses the interactions amongst teachers & between new teachers, mentors and teacher educators. The material will be collected in science teacher education sequences and in school during pre-service placements & the induction year. The intended audience is new teachers, mentors, teacher educators and local authorities. The language used is French. The DVD will include videos from Pairform@nce

4.4 Report on IBST and the Pairform@nce project: creating training paths

Pairform@nce is a national teacher training project in France. It proposes training packages (called training paths), providing resources for the organization of blended teachers training sessions, using a distant platform. The training follows a principle of collective elaboration of lessons, which permits the emergence of teachers' communities, sharing a repertoire of resources (Gueudet & Trouche 2008, Gueudet 2008). The implementation by the teachers of lessons collectively designed permit the development of innovative teaching practices.

In this report we present the Pairform@nce project ; an analysis of two IBST-oriented training paths. The first one, called "Inquiry in mathematics with dynamic geometry systems" proposes training for mathematics teachers working with classes from grade 6 to 9. The second, called "Virtual globes", proposes a training for science teachers about the classroom use of virtual globes (teachers working with classes from grade 6 to 12). In both cases, teams of teachers collectively elaborate lessons. These lessons are IBST oriented, and integrate ICT. One teacher of the team implements the lessons designed in class ; the implementation is observed by other members of the team, which can lead to modifications, and to test of the modified lesson. The report comprises also the analysis of a training drawing on the Geometry Path. This report is addressed to teacher trainers and policy makers and is planned for M18.

4.5 Book on Teacher Collaboration and enhanced methods in science teaching (In French)

This book in French extends the French network about dissemination of IBST and science teacher education beyond the three S-TEAM teams. Contacts with INRP have to be built in order to guarantee good conditions of publication. It will include chapters from other European research contexts, translated from the book planned for WP6 in order to open up the French science teaching landscape.

It includes specific contributions about teachers collaboration, in Pairform@nce and in teachers associations in France, Sésamath in particular, with a perspective of collaboration enhanced by digital means (by Ghislaine Gueudet). Delivery is planned for M33.

WP4e (NTNU): Working with teachers as researchers

The *Lade-project* was conducted by using the R&D work method (research and development work). This means that the researchers' task was to develop the teaching processes together with the teachers at the same time as the processes were researched. The outcome of the package will be a workshop and associated report about how researchers, in their dual role, conduct research in, on and with teachers.

2.4- In brief

- 4.1a Start up conference¹ (M5-6: Sept-Oct 2009).
- 4.1b Dissemination strategy report for innovative methods in France (French and English) (M12: May 2010).
- 4.2 Teacher collaboration guidelines for professional development programmes (M12: May 2010)
- 4.1c Pre-existing conferences will be used for dissemination in specific areas, (e.g. mathematics, biology, etc.) (M12-M24).
- 4.3 DVD of case study teacher education materials for IBST/E (M18: Nov 2010)
- 4.4 Report on IBST and the Pairform@nce project: creating training paths (M18: Nov 2010)
- 4.6 Workshop report on teachers as researchers (M18: Nov 2010)
- 4.5 Book on teacher collaboration and enhanced methods (in French²) (M33)
- 4.1d Final French national meeting (M33).

3. Short term agenda

3.1- Conception of the start up meeting in France

This meeting will be set in Grenoble on 21-22th of October.

¹ In Grenoble.

² and in English.

The objectives will be to create a French network, open to the European science teaching landscape, about teacher collaboration, IBST/E implementation, and equity promotion. This network aims to share resources and could be a platform for further projects or research.

The attendees could be:

- The research teams in science teaching (STEF-Cachan, Aix-Marseille), teacher collaboration (ENFA-Toulouse), teacher education (CREN, CREFI-T), motivation and diversity (etc.) and students .
- The science teacher education teams in universities (or IUFM?) and students.
- The stakeholders, policy makers and school partners: inspection générale, IA-IPR, associations (petits débrouillards, etc.), museum (CCSTI), local authorities (villes éducatives) etc.
- The research institutions and some personalities: INRP, PEGASE, EIST (la main à la pâte), Pierre Léna.
- Some media: Cap Canal, France Inter?

3.2- Design of inquiry approaches

Who will be involved? Teacher educators, mentors, students?

What will be the assessed action? Teacher workshops?

What will be assessed? Scientific knowledge or skills, motivation, self-esteem, metacognition?

What will be the indicators and instrument?

3.3- Design of DVD contents

What and who will be filmed?

What will be the aimed audience?

What equipment will be required?

Who will record and edit the videos?

S-TEAM European project

Design of inquiry approaches

1. Context

WP4 addresses the impact of teacher collaboration (teachers' collective work) on teaching strategies and learning outcomes. The focus is set on implementation of inquiry based science teaching strategies (IBST), coping with pupils' diversity and enhancement of pupils' acquisitions (knowledge and attitude).

1.1- Facing pupils' difficulties at school

In France, for 38% of primary teachers and for 60% of secondary teachers³, the enhancement of teachers' collective work and its organization constitutes a major resource for overcoming problems which result from pupils' diversity. According to these professionals, three specificities of teacher collective work seem to be effective:

- 1/ Collective reflection about new approaches (i.e. adapting assessment processes, changing classroom practices to create temporary groups of pupils with particular learning needs);
- 2/ Opportunities for discussion with specialized professionals;
- 3/ Reinforcement of the connection between the school and its environment (i.e. learners support programs; connections between lower and higher secondary school, particularly the vocational stream).

Enhancing collective work thus appears to be a necessity in order to attain successful outcomes for all learners and to develop equity in science classrooms.

1.2- Improving teacher collective work

The problem of teacher collective work and of its effects is central for two main reasons:

- Given the challenge in teaching strategies resulting from both implementation of methods which emphasizes the learners' activities and enhancing equity in science classroom, teacher collaboration constitutes a relevant resource for teachers.
- Given the stress on group or team-based activities for students within mostly innovative methods for education in science, it is important that teachers adopt similar approaches in their own work.

WP4 addresses impacts of teacher collaboration and teachers' collective work on:

- Implementation of science education methods which emphasizes the learners' activities (e.g. inquiry based methods, learning from mistakes).
- Positive consideration of learners' diversity (e.g. boys vs girls).
- Access to science literacy for all learners (i.e. mastery of science and technical knowledge and culture, stimulation of intrinsic motivation).

A first goal is to support teachers' conceptions change towards a more constructive consideration of difficulties at school through participation in collective work which tackles explicitly the questions of learners' activities in classroom and the management of learners' diversity (Grangeat & Gray, 2007). In other words, the question is whether teachers can go from *selective* conceptions – which are content-centred and make them inclined to steer learners who encounter difficulties at school towards relegation (vocational) courses and to consider major difficulties at school as unmanageable (Postareff, & Lindblom-Ylänne 2008) – towards *equitable* conceptions – which are learning-centered and influence them to design relevant resources for learners and to consider major difficulties at school as a challenge which can be overcome (Boaler, 2008).

A second goal is to spur pupils' change about science achievement and intrinsic motivation, self-esteem and metacognition.

³ See [Les dossiers de la DEPP, 182, 2007](#)

1.3- New Science Teachers' situation and student teachers.

Although new science teachers – as all teachers – seem to be autonomous within their classrooms, they have to interact with other teachers or educational actors, specifically about professional knowledge and learner's attitude and acquisitions. Student teachers are in a similarly position when they are in school during a placement period. Thus, all these actors are involved within a system of mutual exchanges which produce effects which are broadly unknown.

This system is formed by: new science teacher or student teacher (NST), mentor (M) and teacher educator (TE); the students (L) within the courses of NST and M; and by the course contents (C) and professional knowledge (PK) (see figure 1). It is really too large to be accurately explored. Thus, the WP4 project will focus only on interactions amongst NST, M and TE and their effects on learning outcomes and NST's professional development.

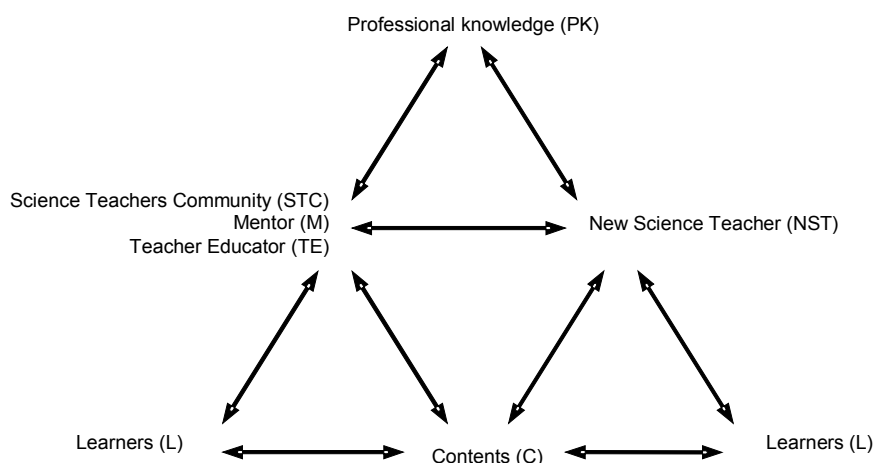


Figure 1: The system in which new science teachers are included

Focusing on new science teachers and student teachers (NST) is justified since first professional experiences have important effects on the entire career.

2. Four questions for an inquiry

Goals: To support the evolution of NSTs' professional knowledge, attitude, and practices through collective activities ; assessment of the effects of teacher attitudes on students' learning with respects of motivation, self-esteem and metacognition.

Questions:

1- Reluctance of the measurement of teachers' attitude with respect to learners' diversity, motivation and school achievement.

2- Reluctance of the measurement of learners' motivation, self-esteem, metacognition and expectations toward scientific careers.

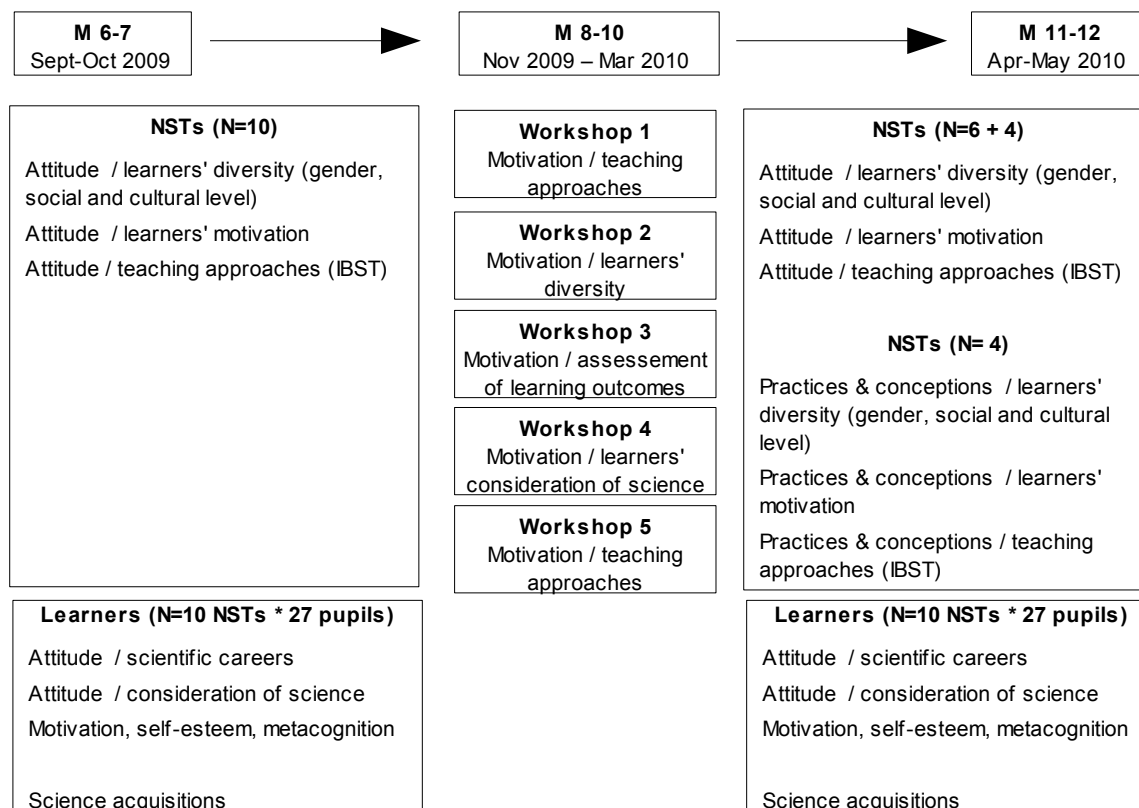
3- Measurement of new science teachers' changes throughout the 5 workshops.

4- Measurement of learners' changes with respect to teachers' attitude.

Diagram of inquiry approach (version march 2009)

First stage (2009-2010): Focusing on NSTs and low secondary schools (11-15 years)

The workshop group (WG) attends to 5 specific workshops per year. The WG involves 10 NSTs acting in low secondary schools (11-15 years).



The workshops aim to improve NST professional knowledge through teacher collaboration: each NST have to present his/her own practices in regards of the subject of the workshop; other NST find out the efficient or weak elements of the presented practices; teacher educators indicate some efficient practices; each NST engage him/herself with implementing one of these practices; during the inter-workshop period NST have to fill in a personal notebook about the implementation of new practices and learners' changes.

The control group (CG) attends to ordinary teacher education programmes. The CG involves 10 NSTs acting in low secondary schools (11-15 years).

Data production:

- Questionnaires about NSTs' attitude / teaching approaches (IBST), learners' diversity and motivation (N=20 NSTs).
- Questionnaires about pupils' motivation, self-esteem, and metacognition (N=20 x pupils' number/NST).
- Test about pupils' science knowledge and understanding or survey of pupils' marks (N=20 x pupils' number/NST).
- Videotaped lessons (N=4 NSTs).
- Commentary of the observed NST about the videotaped lesson (N=4 NSTs).
- Analysis of teachers' material and pupils' marks (N=4 NSTs).

Observation of interactions between some NSTs and their mentor (M) provide complementary data:

- Videotaped meeting between NSTs and their M (N=4 NSTs & 4 Ms).
- Commentary of the observed M about the videotaped meeting (N=4 Ms).

The second stage will extend the scope of the NSTs involved within the enquiry. **The scope of this sample could be extend if other teams adopt the same research design : you could contact the WP4 leader.**