ESERA 2003 - STEDE session 2

Report of Micronetwork 6b Science teacher education programs in Europe: differences and similarities

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- 1. How teachers are prepared in the institutions represented in our Micro-network?
- 2. Which results in Science education are used in preparing Science Teachers?
- 3. Which are the main subjects of preoccupation of young teachers?
- 4. Where can they find answers in science education research or, more widely, in educational research?

The first question led us to compare features and methods of teacher preparation in our institutions.

The work carried out to answer the other questions allowed us to to identify and compare constraints in our institutions and to have hints for possible changes.

Age of students	Berlin	Heidelberg	Paris	Toulouse	Kristianstad	Pavia
18/19						
19/20						
20/21						
21/22						
22/23						
23/24						
Training of teachers for:	Gymna- sium	Realschule	General secondary school	Agricultural secondary school	Secondary school	Secondary school

The first column gives the age of students and each row represents half a year

White cells indicate semesters dedicated to strictly disciplinary content

Dark red cells indicate semesters dedicated to the_formation of didactic and professional competencies (including teaching-practice)

Light red cells represent semesters consisting of courses with both the above mentioned foci

The kind of school for which teachers are trained is given in the last row.

In France and Italy the preparation of secondary-school teachers starts after university graduation in a scientific discipline, while in Germany and Sweden is started at the beginning of university studies.

Comparison of courses offered in the different universities and the methodological and didactical choices on which they are based, allowed us to recognise that:

- In all institutions the prospective teachers attend courses focused on teaching at schools;
- The psycho-pedagogical professional formation is considered important, but differently implemented;
- Teaching practice is a fundamental part;
- Teachers supervising the students in schools during teaching-practice play an important role;
- Work is done to reinforce the link between science education research and initial teacher formation.

Second phase of the work

Institution	Berlin	Heidelberg	Paris- Créteil	Toulouse	Kristianstad	Pavia
Subject matter	Physics	Chemistry	Chemistry Physics	Biology Chemistry Ecology Physics	Science Mathematics	Physics
Methods	Text analysis Interviews	Interviews	Text analysis	Text analysis	Text analysis	Text analysis Interviews Questionnaire
Research objects	Practicum reports (Year 2 students) Student interviews (Year 5)	Student interviews (Year 2) Student interviews (Year 5)	Final theses (Year 5)	Final theses (Year 5)	Final theses (Year 5)	Students' portfolios (Year 1) Students' final reports (Year 6) Teacher interviews (Year 6+)

Phase 2: Analyses of written material

Due to differences in preparing prospective secondary-level teachers in the institutions represented in our Micro-network, we decided to analyse material prepared by student teachers by using a methodology suitable for each group.

We have developed common grids for the analysis of written materials.

Grid used to describe the material written by the student teachers

Type of material – conditions/grid

Place of paper/report in the structure of the education Part of final examination or not Who supervises? School teachers, inspectors, teacher trainers, researchers

Who chooses supervisors? student, institution, external examiners

Who evaluates, marks or advices? researchers, inspectors, teacher trainers

Assessment or advice

Institutional criteria based on national criteria or not

Roles of supervisor/mentor inform students about requests help students get aims/questions explicit help to find bibliography advice on collection and analysis of empirical data advice on presentation

Type of material – conditions/grid, continues

Organisation of supervisors (groups or alone) Choice of topics Institutional instructions Subject Subject matter Physics, Chemistry, ... Science education Pedagogy Method analysis of practice, questionnaire, interview,... Description of projected plan, if required Paper based on theoretical framework or not Requirement for the bibliography Number of ECTS-credits Students working individually or in pairs

Grid used for analysis of the nature of examination papers and reports on teaching practice

Title

Pupils:	Conceptions, motivation, attitudes,
Domain:	Electricity, astrophysics, mechanics,
Activities:	Practical work, documentation, investigation,
Context:	Everyday life, science literacy, attitudes,
Text of paper	
Epistemology:	Theories of teaching and learning guiding the teacher student
Activities:	Exercises, controls, practical work, lessons, documentation,
	using video, visiting museum,
Context:	Everyday life, current scientific event, history of science,
Expectations:	Discipline - order in the class, motivation, knowledge, affective
	goals, social development, skills,
Learners:	Perception of the pupils as learners (Transmissive, social
	constructivism, constructivism, socio cultural), Attention to
	cognitive, affective, social (e.g. peer interaction) or societal
	dimensions.

Categories used in analysis of bibliographies

S Subject

- Ss Subject specific, e.g. Physics, Biology ...
- Sv Viewpoint, values in environmental, gene technology

E Education, Pedagogy, Psychology, general

- Ec Curriculum
- Eg General
- M Method

SE Science Education

- SEn Nature of Science
- SEc Conceptual understanding
- SEl theories of Learning
- SEg General includes ICT for school (ICT-education)

SER Science Ed – Research

- SERt Textbook presentation
- SERr Review article
- SERa Article, doctoral thesis

Phase 2: Interviews

In **Heidelberg** interviews were held, to obtain insight to the questions, since written reports were not available.

Two pairs of students, each at different levels of attainment, were chosen for an interview, so that each pair supposedly marks both ends of a spectrum of awareness for

- the importance of science education research,
- for the design of science education,
- for science education classroom studies more fundamental pedagogical and societal studies

Results and further details

• STEDE session 2: Micro-network6b-Poster with presentation of results from the group

 Papers prepared for the symposium
"Science teacher education programs in Europe: Differences and similarities" (ESERA session 4)

Heidelberg results

The interviews showed a wide spectrum of awareness

- low awareness for the importance of science education research: Science content is what matters!
- high awareness for the importance of science education research: both science content and science education research results are important!
- low awareness for the design of science education research: the student does not know, how such research can be performed
- high awareness for design of science education: suitable design suggestions
- narrow scope: student is focussed on the teaching job
- wide scope: pedagogical and societal issues are also important

Analysis of student teachers' reports on their teaching practice in Berlin

Written reports in which the student teachers described in detail their lesson planning, their teaching practice and their retrospective reflections were analysed. Unit of analysis: Each sentence in the report. The following categories were used:

- A Student teacher refers explicitly to a general or subject related pedagogical theory
- B Student teacher refers explicitly to empirical findings
- C Student teacher refers implicitly to a pedagogical theory or to empirical findings.
- D Student teacher does not refer to any theory or empirical findings, neither explicitly nor implicitly.

The results of the analysis of the sentences in a case study (reported in the poster) indicate that almost all statements are in category D.

Question: How can we achieve that student teachers integrate research results into their reflections on teaching and into their decision making in classrooms?

Examination papers - Kristianstad

- The student's exam papers are related to general pedagogy or to science/math education
- We have focused how students refer to different kinds of literature
- In almost all the papers the national curricula are analysed with a perspective based on the specific research questions
- We have seen that students are referring to science education research, both indirectly from books and directly from research articles and doctoral theses.
- The supervisor and choice of subject influence the students. However, we see variations between students having the same supervisor.
- Students refer to research results and they relate their own results to earlier work in their discussions.
- We found influences from science education research results in the investigated exam papers. This might even indicate that students could be inspired by science education research in their future work. However, we have not been able to establish that in this case study.
- It would be of interest to continue this study and analyse how these students work in their schools, by observation and interviews. We could thereby come closer to answering the questions set out at the beginning

In **Pavia** reports produced by a group of 18 student teachers on their teaching practice were analysed.

The student teachers carried our their activity with pupils in two different frameworks:

- one supported by innovative material produced by our research group in physics education;

- one in a standard condition, i.e. by using the common material and tools available in the school.

The teaching reports of all students were analysed by using the grid prepared in Crete by the STEDE Micro-network 6b.

A comparison of the results highlights the contribute of research to teacher preparation, especially to improve methodology, design of teaching plans (see the poster) and awareness of research in science education.

An essential condition for the use of innovative teaching proposals in initial teacher formation is a good preparation of:

- in-service teachers who receive in their classrooms the student teachers for teaching practice;

- experienced in-service teachers who serve as "supervisors" and have the complete responsibility for the teaching practice of prospective teachers.

In **Paris**, Martine Méheut analysed 28 professional dissertations produced by physics trainee teachers from Creteil Teacher Training Institute (Creteil TTI):

The grid prepared in Rethymno was used to define "the contract" underlying the production of the professional dissertations in Creteil TTI while the analysis of the dissertations was carried with a grid proposed by Martine to Micronetwork6b on February 2003. It is worthwhile to remember that our group succeeded in defining a common grid by working in Crete on Martine's proposal.

The analysis allowed to observe that:

- the main preoccupations expressed by the student teachers are about "motivating" students and "making them work"

- In order to do that, they elaborate activities mainly about "documents" and "practical work". The main directions for evaluating the impact of these trials concern learning first, motivation after.

Their main bibliographical sources are curricular texts, teaching books, teachers' journals, other dissertations. They use also science education literature and, less, psycho-pedagogy literature and history of science.

The results of this first analysis suggested to Martine the following reflections:

- Science Education textbooks are used by the student teachers; it can also be fruitful to publish papers in Teachers' journals (more used that research journals)

- It can be fruitful to present well defined learning activities and an evaluation of their impact in terms of learning effects and pupils' motivation.

In **Toulouse**, at ENFA (Ecole National de Formation Agronomique) since 2001 the student teachers do no longer write a professional dissertation, so the group analysed professional dissertations produced before 2001, precisely:

- 10 dissertations in 1999 and 9 in 2000 for biology-ecology
- 9 dissertations in 1998, 9 in 1999 and 17 in 2000 for physical science.

The analyses of the professional dissertations revealed that the main concerns of student teachers refer to :

- the future activities and teaching strategies for biology-ecology;
- subject matter and activity-based instruction for physics.

The comparison of the use of different sources of information and the bibliography of two significant dissertations suggested, in particular, the conclusion that the extent to which the student teachers take advantage from or refer to research-based insights depend on the supervisors they have.