Teacher Education in Finland: Knowledge Building in the Chemistry and Physics Teacher Education Programme at Helsinki University

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Questions:

- What is the structure of the Finnish secondary teacher education programme and how it is constructed (view to special need education)?

- What kind of support the pedagogical studies in Finland offers to the construction of teacher knowledge from the point of view of:
  - structure of the knowledge
  - origin of the knowledge

- How do Finnish student teachers evaluate the courses of the pedagogical studies from the point of view of the support to the construction of teacher knowledge?
Finnish educational context
Main cornerstones of the education policy
(could be found in policy documents and publications, Halinen (2008); Jakku-Sihvonen & Niemi (2006); Laukkanen (2008))

1. Common, consistent and long-term policy
   - basic models for teacher education and compulsory education are 40 years old
   - support to the development of broad literacy
2. Educational equality
   - compulsory education free of charge to all, including books, meals, transport and health care
   - well-organized special education
3. Devolution of decision power to the local level
   - a headmaster is a pedagogical director
   - local authorities (together with the teachers) plan local curriculum, organise general assessment and use this data for evaluating the schools and for allocation of resources.
4. The culture of trust (national level – district – school – families)
   - no inspectors, no national exams …
   - no private tutoring or gram schools
Country percentile scores compared to the OECD average percentile scores in PISA 2006 science scale

![Graph showing the difference of PISA scores for Finland, Korea, UK, Japan, and OECD average.]
Structure of Finnish Education

- General National Objectives and Education policy (MCE)
  - National Core Curriculum (NBE)
    - Teacher education (pre-service and in-service) (Univ.)
    - Learning materials (publishing houses)
- Teaching
- Learning
- Families

Level 1: national
- Municipalities: Local curriculum
- Schools: principals & teachers

Level 2: district school families

Level 3: classroom

Leadership & management
Questions:

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- How do Finnish student teachers evaluate the courses of the pedagogical studies from the point of view of the support to the construction of teacher knowledge?
Finnish teacher education
A subject/secondary teacher

- typically teaches at grades 7 to 12 (ages 13 to 19)
- teaches typically one major and one minor subjects (e.g. math and physics)

A primary/elementary school teacher

- teaches at grades 1 to 6 (ages 7 to 13)
- teaches typically all 13 subjects
### Teacher education at the University of Helsinki

**University of Helsinki**
(11 faculties, 38,000 students, 7,400 staff members)

<table>
<thead>
<tr>
<th>Faculty of Behavioural Sciences</th>
<th>Faculty of Arts</th>
<th>Faculty of Science</th>
<th>Faculty of Biosciences</th>
<th>Faculty of Theology</th>
<th>Faculty of Social Sciences</th>
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</thead>
<tbody>
<tr>
<td>Dept. of Teacher Education</td>
<td>Teacher Training Schools</td>
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</tbody>
</table>

**Subject teacher education:** pedagogical studies + subject studies

**Primary teacher education**

**Programs are free for students**

**There are heavy selection procedures!**

-> a job for everybody
Structure of the Master’s degree of a subject teacher: 3 + 2 years, 300 cr

- **Major Subject**
  - Bachelor’s level (180 cr)
  - Master’s level (120 cr)

- **Minor Subject**
  - Bachelor’s level (180 cr)
  - Master’s level (120 cr)

- **Pedagogical studies**
  - Master’s level (120 cr)

- **Communication and language studies**
  - Bachelor’s level (180 cr)
  - Master’s level (120 cr)

- **Master’s thesis**

**Teachers** benefit of the research orientation while they make the school curriculum, plan, implement and evaluate teaching and learning.

- Teachers need strong competency in the subject (experts’ knowledge) when they guide students’ learning and problem-solving.

- Subject knowledge, knowledge about teaching and learning, science education and **school practice** are integrated into the students’ own personal pedagogical theory.
Structure of the master degree of a primary teacher: 3 + 2 years

- Bachelor's level (180 cr)
- Master's level (120 cr)

Study credits (cr) = 26 hours of work

- Major Subject Education
- Teaching practice
- BSc thesis
- Pedagogical studies
- Science
- Minor Subject(s)
- Communication and language studies
Aims of the pedagogical studies are to help the students ...

- to **integrate** subject knowledge, knowledge about teaching and learning and school practice into their own **personal pedagogical theory**, 

- to become **aware** of the **different dimensions** of the teacher profession: social, philosophical, psychological, sociological, and historical basis of education,

- to be able to **reflect** on their own personal pedagogical “theory” (reflection *for, in* and *on* action),

- to **develop potentials** for lifelong professional development.
Content of the pedagogical studies in the Subject teacher education programme: 60 ECTS credits equal to one study year

- **Education** (20 %)
  - Psychology of development and learning
  - Special needs education
  - Social, historical and philosophic grounds
- **Subject pedagogy/didactics/PCK** (50 %)
  - Curriculum development and planning of teaching, psychological basis of teaching and learning a subject
  - Evaluation of teaching and learning
  - Educational research and pedagogical thesis
- **Teaching practice** (30 %)
Psychology of development and learning, 4 cp

Objectives:

- A student becomes familiar with development of an individual and group and identifies the special characteristics of the different groups.

- The student develops readiness to understand different views on the growth, development and learning of the human being and from the significance of the interaction between an individual and a group and takes the psychologic principles of the learning into consideration in the teaching.
Special needs education, 4 cp

Objectives: A student

- knows the basic concepts and structures of the special education,
- learn to operate as a part of the other professionals supporting students growth and behaviour, and
- learn to identify different needs of the pupils' and their learning difficulties.

- The student develops readiness for the understanding of the significance of the different pedagogic solutions.
Curriculum development and planning of teaching; Psychological basis related to teaching and learning a subject (PCK), 10 cp

Objectives:

- The student teachers learn to design teaching and learning by taking into consideration
  - the national and local curriculum,
  - the research based knowledge about teaching and learning a subject,

- The student develops readiness
  - to examine the school as an learning environment,
  - to understand the basic values of education,
  - to use versatile teaching methods and ICT,
  - to analyse social situations at schools and
  - to analyse development of his/her own teacher profession.
Framework for designing and implementing the teacher education programme at the University of Helsinki

Research on teacher education
- Structure of teacher knowledge
- Forms of knowledge: professional ... practical

Research on subject and teaching and learning
→ Content

EU and National strategies
- ICT
- Special education

Student learning and evaluations of the programme

Co-operative planning of the programme: Teachers from the subject departments, Department of teacher education, school teachers and the student teachers

Subject teacher education programme

Own research on teacher education

Outcomes, Collection of students’ evaluations
Teacher Education Development Programme (2002): The teacher education programmes should help students to acquire:

- high-level subject knowledge and pedagogical content knowledge, and knowledge about nature of knowledge, …
- academic skills, like research skills; skills needed in developing a curricula, …
- social skills, like communication skills; skill to co-operate with other teachers, …
- knowledge about school as an institute and its connections to the society (school community and partners, local contexts and stakeholders),
- moral knowledge and skills, like social and moral code of the teaching profession,
- skills needed in developing one’s own teaching and the teaching profession.
47,000 children (8.5 per cent) with special education needs. From these 47,000 children:

- 53 per cent are integrated into normal classes:
  - Whole integration: 29 per cent
  - Partial integration: 24 per cent (learning in a special education class, but attending to mainstreaming classes in some topics (music, sports, home economics, ...)

- 33 per cent are attending special education classes (max. 10 pupils), located in mainstream schools

- 14 per cent are in special schools

- An Individual Education Plan (=HOJKS) for each pupil entitled to special education.
In the previous slides, an example of a part time special education within a mainstream school

- Children with mild
  - (1) learning difficulties (e.g. dyslexia, learning difficulties in mathematics and/or in foreign languages, dysfunctions in attention)
  - (2) socio-emotional difficulties or
  - (3) behavioural difficulties

are integrated to ordinary classrooms through special support.

- Support is organized individually, in small groups or simultaneously in the classroom: Classroom teacher and special education teacher work as a team.
IF part time special education is NOT ENOUGH

- **Individualized curriculum** (one subject … all subjects): partly in a special class, partly in a mainstream class.

- **Individualized tutoring**: a school assistant works as a part of the supportive system

- **Home-schooling**, individually or in small groups.

- Integrated pupils get additional teaching support (2 hours/week).
Special schools and special classes:

- Special schools for children with major problems in development
  - Brain damage, mental retardation, visual and hearing defects,

- Children with dysfunctions in multiple areas of development are referred to special classes
  - Autism. Asperger syndrome, mild mental retardation

- But – the trend is toward whole integration and inclusion
School welfare group

Members:
- The School Principal, the chair of the group
- The School Psychologist
- The School Nurse
- The Special Teacher

Temporary members:
- The Class teacher / Subject teacher
- The Social worker
- The Student advisor

Tasks:
- Follows, plans, organizes, evaluates → hope for prevention
- Meetings 2-4 times/month.
- During the school year discusses about the situation with every class teacher (= all the pupils).
- Main target: the physical and psychological well-being of pupils
The process of the co-operation and consultation when (learning) difficulties: Early Identification and Early Intervention

- Teachers or the parents identify the problems of a child (or the child, when older).
- Consultation of the special education teacher.
- Special education teacher assess the learning environment and the child's individual needs.
- Extra support in class or special education individually or in a group.
- School’s welfare group / confidential multi-professional work.
- Psychological tests and evaluation.
- The test results are reported to the pupil and the parents
- School meeting with the parents and teachers
- Individual Learning Plan (ILP) (special materials, therapies...)
- Continuity: School welfare group follow-up and consultation
How to proceed further on….

- Individual Learning Plan
- Tutoring (given by the class teacher)
- Special Education (given by the Special Education Teacher)
- Special class
- School assistant
- Private education in school or at home
- Surveys made in the classroom (working climate, bulling, etc.)
- Co-operation in the room. Interventions and projects.
- Individual and group discussions
- Sending the pupil to further examines or treatment
- Co-operation with the Regional Social Centre
- Co-operation with parents
Teacher knowledge and origins of teacher knowledge
Teacher knowledge domains form a starting-point for characterising ‘a professional teacher’ (Carlsen, 1999)

- The structural perspective is based on different domains of the teacher knowledge, such as
  - Subject matter knowledge,
  - Pedagogical Content Knowledge (PCK) and
  - General Pedagogical Knowledge (GPK)
    (Shulman, 1987; Carlsen, 1999; Hashweh, 2005)

+ Knowledge about how to produce and consume research based knowledge in education (RES)
Academic General pedagogical knowledge (GPK) ↔ Teachers personal pedagogical knowledge

- Research based General pedagogical knowledge (GPK) consists of
  1) classroom management and organisation,
  2) instructional models and strategies,
  3) classroom communication.

- Teachers personal pedagogical knowledge is divided into
  1) personal beliefs,
  2) personal practical experience.

Importance of interplay between GPK and personal pedagogical knowledge through reflection:

- e.g. Gore & Gitlin, 2004
- Morine-Dershimer & Kent, 1999
**Pedagogical content knowledge (PCK)**

- PCK is a knowledge domain that is *synthesis of all knowledge needed* for teaching and learning a specific *content*
- PCK is
  - content specific,
  - event- and story-based *pedagogical construction* an experienced teacher has developed as a result of repeated planning and teaching and reflection on the teaching of the most regularly taught topics.

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Is it possible to organise a course on PCK?

- e.g.
  - Grossman, 1990
  - Bromme, 1995
  - Hashweh, 2005
  - McCaughtry, 2005
  - Nilsson, 2008
Second perspective to teacher knowledge: *origin of knowledge (forms) perspective*

- From the point of view of origins of knowledge, the knowledge could come from (Hiebert et al., 2002):
  - practice
    - experience (Dewey, 1938)
    - practice with feedback (Gagne, 1985)
    - failure (Schank, 1989)
    - reflective practice (Ericsson, 2001)
  - professional (theoretical) sources of information
    - academic books
    - lectures
    - workshops
    - own research
  - Combination
Empirical part of the study
Questions:

- What is the structure of the Finnish secondary teacher education programme and how it is constructed?

- What kind of support the pedagogical studies in Finland offers to *the construction of teacher knowledge* from the point of view of
  - structure of the knowledge
  - origin of the knowledge

- How do Finnish student teachers evaluate the courses of the pedagogical studies from the point of view of the support to *the construction of teacher knowledge*?
Content Analysis of the Pedagogical Studies

- Content analysis started with the domains and origins of teacher knowledge (derived from research literature):
  - Teacher knowledge domains:
    - General Pedagogical Knowledge (GPK);
    - Pedagogical Content Knowledge (PCK);
    - Educational research (RES)
  - Origin of teacher knowledge:
    - Professional (Theoretical) knowledge (Prof);
    - Practical knowledge (Prac)
- However, it is a challenge to analyse the courses
  - Support to PCK and GPK construction is included in several courses
  - Practical knowledge is not only constructed in teaching practice but also during the theoretical
  - Theory is applied in teaching practice (justification of pedagogical decisions in the classroom)
  - **Reflection is kind of “research-making” (systematic: observation – description of it – analysis – explanation.** (Rodgers 2002, 863).
The structure of the pedagogical studies in subject teacher education programme in Finland

<table>
<thead>
<tr>
<th>Pedagogical studies in Finland (60 cp.)</th>
<th>General courses on education, teaching and learning 13 cp</th>
<th>Subject pedagogy (PCK) 17 cp</th>
<th>Educational research 10 cp</th>
<th>Teaching practice 20 cp</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Psychology of development and learning 4 cp</td>
<td>- Psychological basis of teaching and learning of a subject 5 cp</td>
<td>- Research methodology in education 3 cp</td>
<td>- Supervised basic teaching practice 7 cp</td>
<td></td>
</tr>
<tr>
<td>- Special needs education 4 cp</td>
<td>- Curriculum development and planning of teaching 5 cp</td>
<td>- Teacher as a researcher-seminar 3 cp</td>
<td>- Supervised applied teaching practice 5 cp</td>
<td></td>
</tr>
<tr>
<td>- Social, historical, and philosophical basis of education 5 cp</td>
<td>- Evaluation of teaching and learning, evaluation of a curriculum 7 cp</td>
<td>- Minor thesis in pedagogy 4 cp</td>
<td>- Supervised advanced teaching practice 8 cp</td>
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<td></td>
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<td>- Reflection supported by portfolio assessment work</td>
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</tbody>
</table>

In Finland huge amount of PCK is taught also at the departments of Physics, Chemistry,...
### The main categories of the contents

<table>
<thead>
<tr>
<th>Main categories</th>
<th>Definition</th>
<th>Examples of original expressions *)</th>
</tr>
</thead>
</table>
| **learning of an individual**    | Student teachers learn to guide students at school to learn knowledge or skills through teaching and learning activities | - School as a learning and operating environment  **GPK**
|                                  |                                                                          | - Student teachers learn to use versatile teaching methods, information and communication technology in chemistry and physics (Eval.) **PCK** |
| **different needs of students**  | Student teachers learn to take into account different needs of students and learn to identify their learning difficulties | - Student teachers learn to identify different kinds of learners (B_prac.)
|                                  |                                                                          | - Student teachers learn to identify pupils' learning difficulties (Spe.) |
| **learning (and development) of a group** | Student teachers learn to guide students at school to acquire knowledge or skills through co-operative teaching and learning activities | - Student teachers become familiar with the development of a group (Psy.) |
## Output of the analysis

<table>
<thead>
<tr>
<th></th>
<th>GPK (25)</th>
<th>PCK (27)</th>
<th>RES (25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psy</td>
<td>learning (and development) of a group (5)</td>
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<td></td>
<td>skills for interaction (1)</td>
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<tr>
<td>Spe.</td>
<td>different needs of students (4)</td>
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<tr>
<td></td>
<td>learning (and development) of an individual (1)</td>
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<tr>
<td>Phil</td>
<td>school – society link (3)</td>
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<tr>
<td>Cur.</td>
<td></td>
<td>learning of an individual (3)</td>
<td>reflection (1)</td>
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<td>school – society link (2)</td>
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<tr>
<td></td>
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<td>learning of a group (1)</td>
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<td></td>
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<td>use of ICT in learning (1)</td>
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<td>design teaching based on nature of science (1)</td>
<td></td>
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<tr>
<td>Eval.</td>
<td>school – society link (1)</td>
<td>learning of an individual (4)</td>
<td>reflection (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>school – society link (4)</td>
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<td></td>
<td></td>
<td>design teaching based on the nature of science (1)</td>
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<tr>
<td>Sem.</td>
<td></td>
<td></td>
<td>consuming educational research (4)</td>
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<td></td>
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<td>producing educational</td>
</tr>
</tbody>
</table>
## Output of the content analysis

<table>
<thead>
<tr>
<th>Area</th>
<th>GPK (26)</th>
<th>PCK (27)</th>
<th>Educ. res. (25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychology of development and learning</td>
<td>6</td>
<td></td>
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</tr>
<tr>
<td>Special needs education</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social, historical, and phil. basis of education</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curriculum development and</td>
<td></td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Evaluation of teaching and learning</td>
<td>1</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Research methodology in education and teacher as a researcher-seminar</td>
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<td>8</td>
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<tr>
<td>Basic Supervised teaching practice</td>
<td>4</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Applied Supervised teaching practice</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Advanced Supervised teaching practice</td>
<td>6</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Reflection</td>
<td></td>
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<td>4</td>
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</tbody>
</table>
Number of single aims, recognised based on the analysis of course descriptions
Questions:

■ What is the structure of the Finnish secondary teacher education programme and how it is constructed?

■ What kind of support the pedagogical studies in Finland offers to the construction of teacher knowledge from the point of view of
  - structure of the knowledge
  - origin of the knowledge

■ How do Finnish student teachers evaluate the courses of the pedagogical studies from the point of view of the support to the construction of teacher knowledge?
Questionnaire and questionnaire data analysis

- Data was gathered by questionnaires in three years:
  \[ N_{2004-2005} = 51; \ N_{2005-2006} = 75; \ N_{2006-2007} = 80 \]
- 70% to 80% of the students answered the questionnaires.
- Physics & chemistry student teachers’ median age 26
- The questionnaires were similar in each year (several open and closed questions about the pedagogical studies)
  - Five-point Likert scale
    \((1 = \text{significance small} \ldots 5 = \text{significance big})\)
    for evaluating the value of each courses from the viewpoint of support to construction of teacher knowledge.
  - One question focusing on students’ opinions about the research orientation of pedagogical studies
  - Qualitative content analysis of the answers to open questions
Students evaluations of the program: Value for development of teacher knowledge

Education:
- Psychology of development and learning (4 cp.)
- Special needs education (4 cp.)
- Social, historical, and philosophical basis of education (5 cp.)

Pedagogy:
- Psychological basis related to teaching and learning science (10 cp.)
- Curriculum development and planning of teaching (7 cp.)
- Research Methodology and making of pedagogical research (10 cp.)

Teaching practice:
- Basic Teaching Practice in a Teacher Training School (7 cp.)
- Master’s Level Teaching Practice in a Teacher Training School (8 cp.)
- Learning from practice through reflective thinking

Significance of a course small for development of a teacher knowledge
Significance big for development of a teacher knowledge

Significance for development of a teacher knowledge
Output of the qualitative analysis: *Psychology of development and learning*

- About 13% of the students described in a positive way and only 7% in a negative way how the course “Psychology of development and learning” supported knowledge construction.
  - Positive comment: “The issues discussed during the course were interesting”
  - Negative comment: “Since I am becoming a secondary teacher, knowledge about the development of a small child is not necessary information for me”

- Only 5% of the students wrote comments which can be linked to the origin of the knowledge.
Output of the qualitative analysis:

Teaching practice

Positive comment:
- “The Basic Teaching Practice was the most important period during the autumn term.”
- “My own lessons and the lessons of other students opened my eyes to the reality of the school.”
- “Learning by doing is the best.”

Negative comment:
- “The topics of the ‘school as a community-seminar’ should be more practical, for example, focusing on the behaviour of students.”
- “Reflection is ok – but why does one have to write everything down?”
Qualitative evaluations of the courses

Percentage of comments considering aims of the course
(value of the course from the point of view of support to development of teacher knowledge)

Positive
Negative

Psychology of development and learning
Curriculum development And ...
Basic Supervised teaching practice
Research orientation

- More than 50% of the students agree or strongly agree:

  research orientation of the teacher education programme is very important for becoming a teacher.
Output of the qualitative analysis: 
*Research orientation and reflection, 1*

- The meaning of educational concepts

  + conceptualisation of phenomena that are central is acquired through literature.

  - It is not possible to learn a teaching profession through lecturing but through practice.
Output of the qualitative analysis: 
*Research orientation and reflection, 2*

- The meaning of reflection and justification of decisions based on research

  + *Reflection is ok – but why does one have to write everything down*

  - *What is the purpose of completing the portfolio?*
Output of the qualitative analysis: 
*Research orientation and reflection, 3*

- The meaning of producing a small scale research
  
  + Science education orientation is important in research seminar.
  + It is a way to reach teacher autonomy.

- Competence in conducting research is not so important
Discussion and conclusions
Domains of Teacher knowledge

Student teachers evaluated the courses in a similar way from the point of view of becoming a physics/chemistry teacher:

- There is a balance among the courses supporting the development of GPK and PCK
- The programme is working
Teaching practice and reflection

- According to the student feedback, teaching practice is evaluated very highly compared to other courses.
  - It is practical, hands-on type of work
  - High quality supervision
  - It helps the students to combine research-based knowledge and practice.

- Reflective thinking skills are essential for become reflective and autonomous professionals. However, new forms/models should be (and are already) developed.
Research orientation

- Research seminar gets lower evaluations: A challenge to motivate the students in their own research (producing of educational research).

- A Finnish teacher needs research orientation when he or she is developing local level curriculum or participating teachers in-service training.

- Differences between producer and consumer of the pedagogical research should be discussed more while planning the programme?
A need to develop instruction in teacher education

- Awareness of epistemological assumptions underlying the teacher education programme
  - not considering only structure of the programme and but also the origin of knowledge when designing the programme

- Support to student teachers active role in knowledge construction and reflection through offering and combining
  - theoretical knowledge (e.g. learning psychology)
  - individual experiences/ knowledge created in practice

- Facilitating and use of appropriate tools in the process