第 13 回北海道大学－ソウル大学ジョイントシンポジウム分科会と招待講演　－理科教員養成の日韓比較研究とフィンランド・ヘルシンキ大学の中等教員養成課程－

大野　栄三

北海道大学は、ソウル大学（Seoul National University）とのジョイントシンポジウムを毎年開催している。2010 年の第 13 回は北海道大学が会場となり、多くの分科会が開かれた。筆者は、2 年前からソウル大学の Junehee Yoo 准教授（College of Education, Department of Physics Education）とともに、毎年、分科会を組織してきた。今回は学術振興会・二国間交流事業の援助を受け、韓国 NRF との共同セミナーとして、期間と規模を拡大して開催した。共同セミナーは、「フォーマル及びインフォーマルな教育環境における理科教員養成の日韓比較研究」をテーマに、11 月 4, 5 日の 2 日間にわたって開催された。日韓の比較研究として準備を始めたが、フィンランドのヘルシンキ大学、台湾の台湾師範大学（National Taiwan Normal University）からの参加があり、国際的な広がりをもったセミナーとなった。紅葉が美しいキャンパスで、二日間、セミナールームに缶詰になり、濃密な議論をなごやかな雰囲気で行うことができた。共同セミナーのねらい、スケジュールと発表内容、共同セミナーで知ることのできた各国の動向の一部分については、本稿末尾に資料 1、2 に掲載している。

通常の理科授業を受けている特別な教育配慮が必要（special education need）な生徒の学習について、中学校を事例とした研究報告（Session I: presentation3）があった。インクルージョン教育は日本では議論が始まったばかりと言ってもよいだろう。韓国では、フルタイムのインクルージョン教育を受けている生徒の数は 12,006 人（学級数は 10,905）である。学校教育の歴史や文化に違いがあるため単純に比較することはできないが、日韓の教師は、特別な配慮が必要な生徒に何をすべきか、彼らのために設定した目標が達成されたのかをどのように判断すればよいのかなど、共通する不安や悩みを持っている。これからの教員養成では、免許取得教科にかかわらず、上述のような課題について学べるようにすべきである。

共同セミナー終了後、11 月 6 日にセミナー整理会を開催し、フィンランドから参加の Jari Lavonen 教授（University of Helsinki, Department of Teacher Education）に招待講演をお願いした。ヘルシンキ大学の中等教育教員養成について、そのカリキュラムの詳細や特別な教育的配慮を必要とする子どもたちへの対応を講演してもらった。招待講演で使用されたプレゼンテーション・スライドの一部を、本稿末尾に資料 3 として掲載している。

フィンランドでは、人口密度の低い地域に、複式学級の小規模学校が多くある。そのような学校では、教師自らが判断し、学校教育をつくり、実践していかねばならない。教員養成では、自立した、研究能力をもった人材を育てることが重視されている。ヘルシンキ大学の中等教員養成コースは、まず入口で希望者の 10%を選抜するという狭き門で、優秀な学生を選び、理工系の専門教育や大学附属学校での教育実習も含めて 5 年間の修士レベ

ルの養成を行っている（EU では、学部 3 年＋修士 2 年)。このコースを修了すれば全員が教職に就く。教育の社会的、文化的背景が日本と大きく異なっているため、フィンランドの教員養成がいかに優れているとしても、それをそのまま日本に取り入れるだけではうまく行かない。細部を理解し、日本の自家薬籠中のものにする努力が必要である。

資料 1.　共同セミナーのねらいとタイムテーブル

共同セミナーは以下の 3 つのセッションから成る。

Session I:　Analyzing School Science Lessons and Improving Instructions

Theme of this session is to compare the methods for analyzing science lessons. The comparative studies progressed by videotaping science lessons, having interviews with science teachers, getting textbooks and instructional materials in Korea and Japan.

Discussion in Session I: We focus on making-up lessons by science teachers in both countries. We discuss about distinguished lessons, for example, using ICT and individually-targeted instructions for retarded students. We also take notice of effective instructions for small-group activities in some inclusive lessons. Also, in order to understand linguistic characteristics of texts in science textbooks in various levels and science magazines, the texts will be analyzed in terms of Systemic Functional Linguistics.

Session II:　Pre-service and In-service Teacher education

There are two themes of this session. The first is to compare education programs for the science teacher's reeducation at the level of the graduate school in Korea and Japan. And the second is to reconsider the teacher education program based on the survey about opinions of young, incoming science teachers

Discussion in Session II: We discuss about an extension of the teacher education program to 6 years. We consider worthwhile programs for students, or future teachers at the level of the postgraduate school. The science teachers' reeducation is also an important issue. We compare programs for in-service science teachers in Korea and Japan. The Japanese team surveys the opinions of Japanese young and incoming teachers. We discuss about the teacher education program based on the survey. Korean team gives presentations about issues in six year teacher training courses including some implications from critical views on constructivism and how to implant cutting edge science into teacher professional development courses.

Session III:　Informal Science Education in Korea and Japan

The theme of this session is to compare the informal science education in Korea and Japan. The informal science education uses museums and science pavilions.

Discussion in Session III: We discuss about the situations in Korea and Japan that the informal science education has various meanings according to context. Japanese team

gives a talk on the activities in the university museum, and a presentation of making brochures and pamphlets for effective informal science education in museums and science pavilions. Korean team gives presentations in science learning of visitors in free visits, using question cards and docent guidance contexts in science museums and visitors' understanding on exhibition materials.

共同セミナーのタイムテーブル（11 月 4、5 日）

Thursday, 4 November, 2010

Session I: Analyzing School Science Lessons and Improving Instructions

Presentation1 9:10am－9:40am

Linguistic Analysis of Science Lessons and Improving Instructions Eizo Ohno (Hokkaido University)

Presentation2 9:40am－10:10am

Understanding Science Language and Science Writing in Various Contexts

Chan-Jong Kim, Hyun-Jung Cha (Seoul National University)

Presentation3 10:10am－10:40am

Analysis of learning activities of mentally retarded students in inclusive classes

Junehee Yoo, Sang Kyung Chang, Sung Eun Lee (Seoul National University)

Presentation4 10:50am－11:20am

Analysis of Science Lesson through Group Discussion at Junior High School

Hatsuo Mitsuishi (Tokyo Gakugei University)

Presentation5 11:20am－11:50am

New Technology to Meet Students' Learning Needs—A Future Smart University Classroom in Taiwan—

Chun-Yen Chang (National Taiwan Normal University)

Dean's speech Shin-ichi Tokoro (Hokkaido University)

Presentation6 1:20pm－1:50pm

The Trends of science education in secondary schools in Finland Jari Lavonen (University of Helsinki)

Discussion 1:50pm－2:20pm Discussant: Minoru Tanaka (Hokkaido University of Education)

Session II (Part I): Pre-service and In-service Teacher education

Presentation1 2:30pm－3:00pm

Cultural Interpretation of Teaching in a Korean Science Education Lesson: "Optimization of Behavior of Teaching in Everyday Lesson Interaction" Youngdal Cho (Seoul National University)

Presentation2 3:00pm－3:30pm

Science Teacher's improvement in Graduate School of Education: Kyoshoku Daigakuin

Kyoko Ishii (Fukui University)

Presentation3 3:30pm－4:00pm

A case study of the Professional development of science teachers through RET program

Heui-Baik Kim, In Young Baik(Seoul National University)

Presentation4 4:10pm－4:40pm

Distinguished Science Teacher Training Project Fumiko Okiharu (Niigata University)

Presentation5 4:40pm－5:10pm

Recent change on the teacher education in Taiwan Chen-yung Lin (National Taiwan Normal University)

Presentation6 5:10pm－5:40pm

Teacher Education based on Survey of Young and Incoming Teachers' Opinions

Tetsuo Umetsu (Hokkaido University)

Reception 7:00pm－9:00pm

Friday, 5 November, 2010

Session II (Part II): Pre-service and In-service Teacher education

Presentation7 9:00am－9:30am

Elementary Teachers' Epistemological Understanding of School Science Lab

Sun-Kyung Lee (Seoul National University)

Presentation8 9:30am－10:00am

Scientific Explorations of Questions that are not usually answered in Chemistry Class

Dae-hong Jeong (Seoul National University)

Presentation9 10:00am－10:30am

Continuing Professional Development (CPD) through teachers' collaboration across subjects

Jee-young Park*, Sibel Erduran, Xiaomei Yan (*Seoul National University, University of Bristol)

Presentation10 10:40am－11:10am

Exploring a Dilemmas Episode of a Physics Teacher who is Teaching Newton 's First Law

Gyoungho Lee, Sangwoon Kwon, Minna Kim, Jiwon Park, and Eunji Yoo (Seoul National University)

Discussion 11:10am－11:50am Discussant: Masako Tanemura (Osaka Kyoiku University)

(Demonstrations of historical experimental materials for science education)

Excursion: Hokkaido University Museum 1:00pm – 2:40pm

Session III: Informal Science Education in Korea and Japan

Presentation1 2:50pm－3:20pm

Science Communication and Informal Education in Science Centers—A Case Study on Sapporo Science Center

Gensei Ishimura, Yukari Furuta, and Tae Toba (Hokkaido University)

Presentation2 3:20pm－3:50pm

Understanding Informal Earth Science Learning with Socio-Cultural Lens in Natural History Museums

Chan-Jong Kim, Eun-Ji Park (Seoul National University)

Presentation3 4:00pm－4:30pm

Challenges of University Museums as One of Free-choice Science Learning Settings —Educational Activities in the Hokkaido University Museum Makiko Yuasa (Hokkaido University)

Presentation4 4:30pm－5:00pm

Visitors' understanding on exhibition materials about Tesla Coil at Gwacheon National Science Museum

Junehee Yoo, Il Lee, Jeongwoo Park, Nayoung Lee*(Seoul National University, * Kwanghee Middle School)

Discussion 5:00pm－5:40pm

資料 2. 韓国、フィンランド、台湾の動向から（文責：大野栄三）

< Korea >

The special education needs in Korea is reported in this seminar. The number of full time inclusive students is 12,006 and the number of full time inclusive classes is 10,905 in Korea. It is mistake to compare those numbers between Korea and Japan, without taking into account the each historical background of school education. The inclusive education in Japan has just begun. Science teachers in both countries are, however, confronted with the same difficulties. Science teachers don't know what to do for special education need students or to include special education need students in their classes, and how they can know any cognitive improvement of special education need students in inclusive classes. The analysis of science lessons in the inclusive class in Korea is impressive.

Teachers should understand students' circumstances and communicate with each student appropriately. The two presentations in Session I focus on linguistic features of science education. Language is a major barrier to most students in learning science lessons. In Korea, the way to use the language of science in science education is investigated. Systemic Functional Linguistics is used for analyzing the linguistic features of science writings.

In case of teacher education, bridging the gap between cutting edge science and science education, teacher collaborations, optimization teaching behaviors are emerging topics in Korea. For informal science education, socio-cultural lenses are useful methods, and specific topic such as using questing cards, understandings in labels are approached.

< Finland >

In Finland, the school-based curriculum is constructed locally based on the national guideline. The separate science subjects are taught by highly specialized subject teachers at lower secondary school. The goals and contents for science education fit well with the OECD scientific literacy. Teachers are responsible for selection of teaching and learning materials published by independent houses. There was a lot of practical work in a science lesson, but the number of class debate activities is lower than the OECD average. According to the national survey in Finland, students wish that their ideas are used by teachers, and small group discussion in classroom.

A Finnish teacher should be an autonomous professional and have research orientation, reflective thinking skills. The secondary teacher education program is working and there is a balance supporting the development of general pedagogical knowledge and pedagogical content knowledge. However, according to the survey of students' feedback, the research seminar gets lower evaluations. It is required to motivate students in their producing of educational research.

< Taiwan >

Since the normal education act in 1994, two of three normal universities for training secondary school teachers changed their names to the ones without "normal". Nine normal colleges for training elementary school teachers are renamed or merged with neighboring universities. The teacher education act in 1994 allows comprehensive universities to offer teacher education programs. The number of teachers in preparation increased from about 9,707 in 1995 to 20,274 in 2004, and decreased to 8,825 in 2010. The policy of teacher education has been influenced by the low birth rate and excess of teachers in Taiwan.

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

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

13th Hokkaido University – Seoul National University Joint Symposium: Comparative Study of Science Teacher Education at Formal and Informal Educational Settings in Korea and Japan
4 – 5 November, 2010

Jari Lavonen
Professor of Physics and Chemistry Education,
Head of the department
Department of Teacher Education,
University of Helsinki, Finland

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**?

2

Finnish educational context

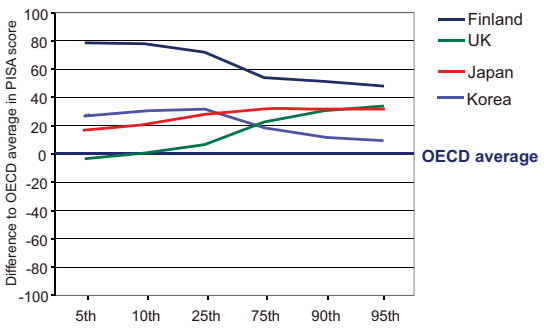
Main cornerstones of the education policy

(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

4

Country percentile scores compared to the OECD average percentile scores in PISA 2006 science scale



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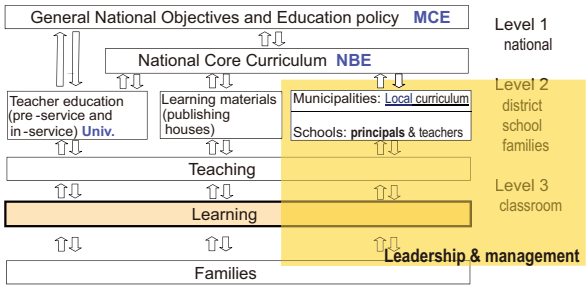
Structure of Finnish Education



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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**?

7

Helsinki university main building

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

9

Teacher education at the University of Helsinki

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

Faculty of Behavioural Sciences	Faculty of Arts	Faculty of Science	Faculty of Biosciences	Faculty of Theology	Faculty of Social Sciences
Dept. of Teacher Education / Teacher Training Schools					

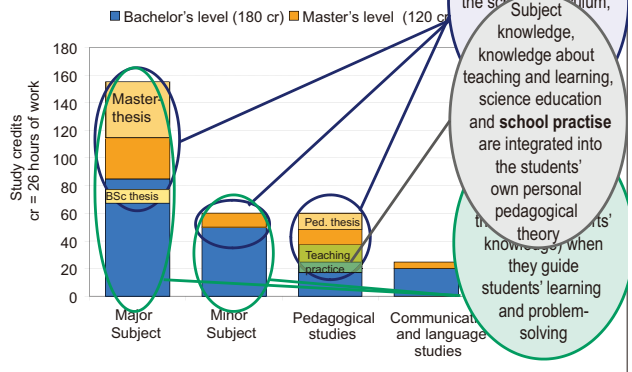
Subject teacher education: pedagogical studies + subject studies

Primary teacher education

Programs are free for students
There are heavy selection procedures!
-> a job for everybody

10

Structure of the Master's degree of a subject teacher: 3 + 2 years, 30



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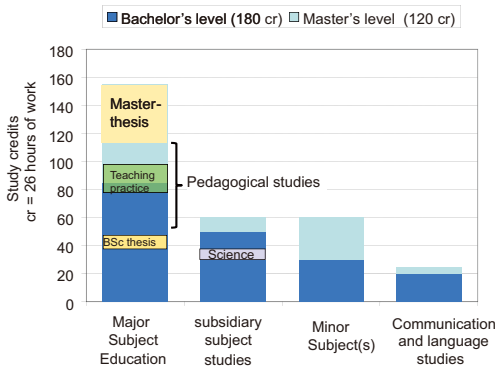
Structure of the master degree of a primary teacher: 3 + 2 years



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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.

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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 %)

14

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.

15

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.

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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.

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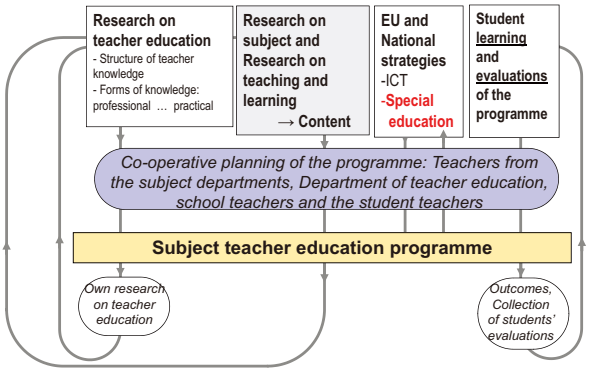
Framework for designing and implementing the teacher education programme at the University of Helsinki



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***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.

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Special education in Finland
by Nina Sajaniemi

- 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.

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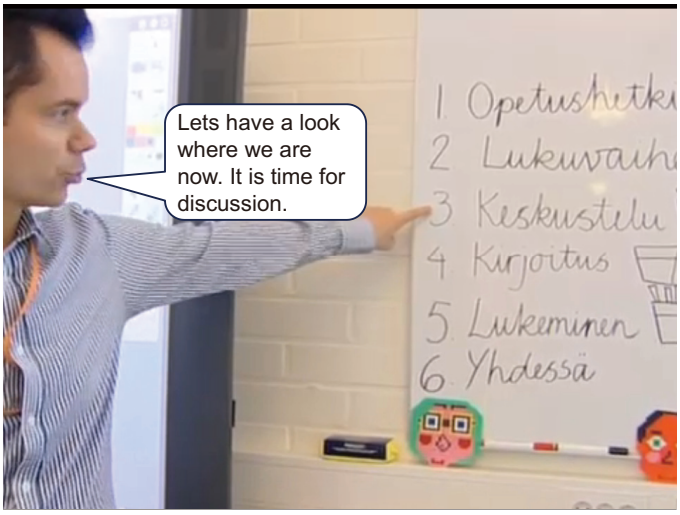

Use of the learning materials (*handbooks, textbooks, workbooks, web-based environments,…*) support integration of pupils

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

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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 assistants work as a part of the supportive system
- Home-schooling, individually or in small groups.
- Integrated pupil s get additional teaching support (2 hours/week).

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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 syndrom, mild mental retardation
- But – the trend is toward whole integration and inclusion

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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

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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

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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

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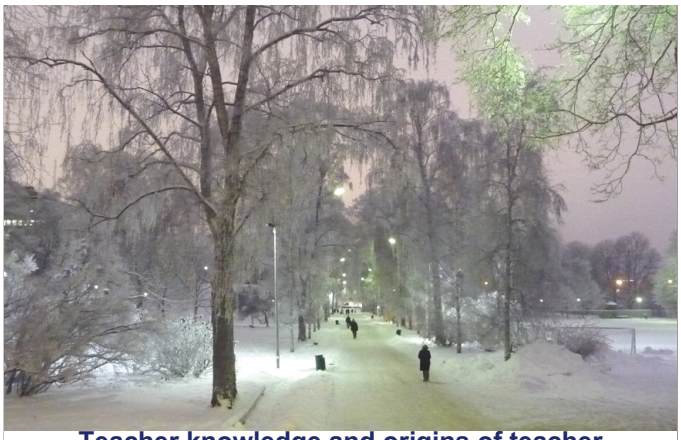

Teacher knowledge and origins of teacher knowledge

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)

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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 strate
  3) classroom communic
- Tea ogical
  ided into
  sonal 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

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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-b
  pedagogi
  her has developed
  of repeated
  planning and teaching and
  - reflection on the teaching
  of the most regularly taught topics.

Is it possible to organise a course on PCK?

e.g.
Grossman, 1990;
Bromme, 1995
Hashweh, 2005
McCaughtry, 2005
Nilsson, 2008

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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

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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**?

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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).

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The structure of the pedagogical studies in subject teacher education programme in Finland

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

In Finland huge amount of PCK is taught also at the departments of Physics, Chemistry,..

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The main categories of the contents

Main categories	Definition	Examples of original expressions *)
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.)

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Output of the analysis

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

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Output of the content analysis

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

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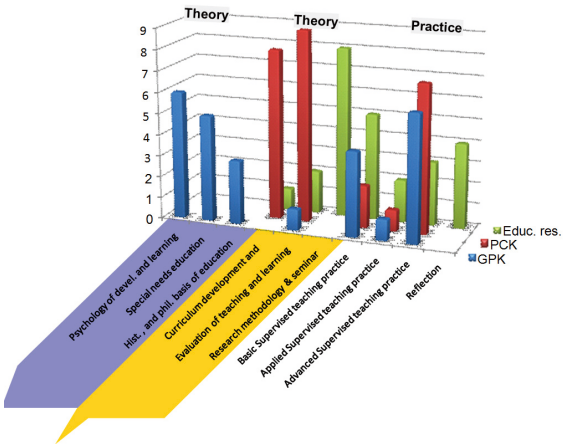
Number of single aims, recognised based on the analysis of course descriptions



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**?

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Questionnaire and questionnaire data analysis

- Data was gathered by questionnaires in three years: $N_{2004\text{-}2005} = 51$; $N_{2005\text{-}2006} = 75$; $N_{2006\text{-}2007} = 80$
- 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 = significance small … 5 = 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

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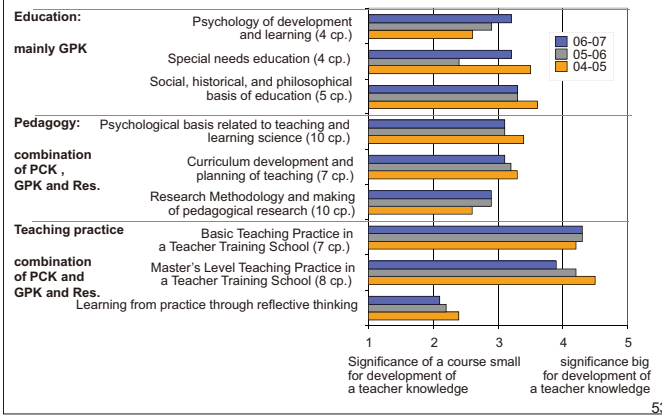
Students evaluations of the program: Value for development of teacher knowledge



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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.

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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?*"

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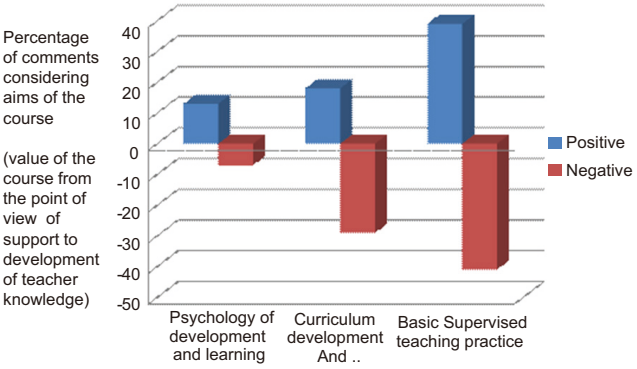
Qualitative evaluations of the courses



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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.

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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.*

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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?*

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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*

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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

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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.

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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?

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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

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