

# Curriculum Vitae

## Terhi Mäntylä

**Faculty of Education  
University of Tampere  
FI-33014 University of Tampere  
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### 1. Education and degrees awarded

- Doctor of Philosophy, University of Helsinki, physics (physics education), 20.4.2011 Helsinki (Faculty of Science, P.O.Box 64, FI-00014 University of Helsinki, tel. +358 (0) 2941 911)
  - Dissertation thesis (article-based) "Didactical reconstructions for organizing knowledge in physics teacher education", grade ECLA
- Licentiate of Philosophy, University of Helsinki, physics (physics education), 27.1.2006 Helsinki
  - Licentiate's thesis "From fragmented to structured knowledge in physics teacher education", grade ECLA; Studies for a higher degree, 64 cr, grade 5
- Master of Philosophy, University of Helsinki, Physics teacher programme, 16.5.2003, Helsinki
  - Master's thesis "Sähkövirran opetusmallit lukiossa" (Teaching models of electric current in upper secondary school), grade ECLA; Physics, 174 cr, grade 5, Educational sciences (Pedagogical studies for subject teachers), 70 cr, grade 5, Mathematics, 78 cr, grade 3
- Adjunct professor (Title of Docent): Didactical physics, Tampere University of Technology, 1.11.2016

### 2. Other education and training, qualifications and skills

- Other academic education
  - University pedagogy I, 10 cr, grade 5, 2006; Advanced studies of educational sciences, 14 cr; Chemistry, 69 cr, grade 3, 2008; "Oppiminen ja opetus virtuaaliyliopistossa" (Learning and teaching in virtual university), OPE.FI II – education, 10 cr, 2002, University of Helsinki.
- Other academic and professional courses and schools
  - Summer School of European Science Education Research Association 2006, 15.-22.7.2006, Braga, Portugal; NSF Summer Institute in Physics and Physical Science for In-service teachers 2004, special recognition, 19.7.-15.8.2004, University of Washington, Seattle, U.S.; Faculty Development Workshop on Teaching Physics by Inquiry, 12.-16.7.2004, University of Washington, Seattle, U.S.; Workshops of physics education (128th AAPT National Meeting, January 2004)

- Use of ICT in education -courses (organized by Educational Technology Center of University of Helsinki: Teacher in WebCT, 2002; WWW – What and why to the net? 2002; PowerPoint in education, 2002; BSCW in education, 2003; Moodle in education, 2010; Knowledge Construction through Prezi, 2013.

### **3. Linguistic skills**

- mother tongue: Finnish
- other languages: English (excellent), Swedish (good), German (beginner level)

### **4. Current position**

- University lecturer (mathematics and science education), Faculty of Education, University of Tampere, 1.8.2014 –

### **5. Previous work and experience**

- Post-doctoral researcher (principal investigator) (Academy of Finland), Department of Physics, University of Helsinki, 1.9.2012-31.7.2014
- Post-doctoral researcher, Department of physics, University of Helsinki, 1.5.2011-31.8.2012
  - Participant in research projects funded by Academy of Finland: Network models in describing students' learning process of organized knowledge structures of physics 1.1.2010-31.12.2013; Development of teacher students' thinking skills and its relation to acquisition of pedagogical content knowledge 1.8.2010-31.12.2013, Both: PI Docent Ismo T. Koponen
- Visiting researcher in Learning in Science and Mathematics –group, School of Education and Environment, Kristianstad University, Sweden, 1.8.2011-31.7.2012
- Doctoral student, Department of physics, University of Helsinki, 1.1.2003-30.4.2011
- During years 2006-2010 on parental leaves altogether three years, daughters were born in September 2006 and July 2008
- Research assistant, Department of physics, University of Helsinki, 1.1.2001-31.12.2002

### **6. Research funding as well as leadership and supervision**

- Post-doctoral research project (SA257400, Academy of Finland, 1.9.2012-31.8.2015, 246 700 eur (cancelled 1.8.2014 onwards due to the starting at the current position)
- Participant in the preparation of funding applications for a research group:
  - “Development of teacher students' thinking skills and its relation to acquisition of pedagogical content knowledge” PI Docent Ismo T. Koponen (SA136582, Academy of Finland, Academy Project funding 2010, 215 929 eur )
  - “Modeling Conceptual Change”, Docent Ismo T. Koponen (Finnish Cultural Foundation, Workshop in Science, 2012-2013, 200 000 eur)
  - “Keys to Conceptual Change - Mystery Room as STEM Learning Environment for Grades 7-9 in the School (KEY)” PI Prof. Eero Ropo (Academy of Finland, Academy Project funding 2015, not funded)

- Supervision of dissertation theses
  - Tommi Kokkonen, Modeling the learning of scientific concepts and conceptual change as a complex system (article-based, initial title), 2013-2017 (primary supervisor)
  - Sharareh Majidi, Knowledge Organization and its Representation in Teaching Physics: Magnetostatics in University and Upper Secondary School Levels (article-based), 2013 (secondary supervisor)
- Supervision of Licentiate's theses
  - Tuula Oksman, Kausaalisten selitysmallien vaikutus fysiikan oppimiseen (The effect of causal explanation models to the learning of physics), ongoing
- Co-team leader in HET (Higher Education in Transition) research subgroup "Student Experience and Learning"

## 7. Merits in teaching and pedagogical competence

- Pedagogical studies for subject teachers (70 cr), qualified physics, mathematics and chemistry teacher, Advanced studies of educational sciences (14 cr), University pedagogy I (10 cr)
- Responsible teacher (lecturer) – curriculum planning and implementation  
*School of Education, University of Tampere 2014-2016*
  - Advanced studies of educational sciences:  
Research in teaching and learning of subject (5 cr), one semester, 2 times
  - Intermediate pedagogical studies of subject teachers:  
Subject didactics I (5 cr), one semester, 3 times; Subject didactics II (5 cr), 2 times; Research in subject didactics and inquiring teacher (7 cr), one and half semester, 2 times
  - Class teacher education:  
Physics and chemistry for elementary teachers (2 cr), half semester, 2 times
  - Supervision of subject and class teacher trainees 30 hours/year since autumn 2014
- Department of physics, University of Helsinki (2003-2014)*
  - Advanced studies for pre-service teachers:  
Master's thesis seminar for teachers (3 cr), two semesters; Concepts and structures of physics II (5 cr), half semester, 2 times; Structures and processes of school physics (5 cr), one semester, 5 times
  - Intermediate studies for pre-service teachers: Concept formation of physics I (5 cr) and II (5 cr), distance courses, one semester  
(The language of above teaching has been Finnish)
- Other*
  - Lecturer and supervisor in NorSEd research school on History and Philosophy of Science in Science Education (international), october 2012, Helsinki
- An important part of my teaching and research has been the research-based development of student-centred teaching methods and solutions that support student's learning processes.
- Supervision of Master's theses
  - Maija Nousiainen (nee Pehkonen), Fysiikan käsittekarttojen sisällön ja graafisen rakenteen arviointi opettajankoulutuksessa (The evaluation of content and graphical structure of physics concept maps), 2007
  - Tommi Kokkonen, Käsitteet ja käsitteellinen muutos tasavirtapiirien kontekstissa (Concepts and conceptual change in context of DC-circuits), 2013
  - Janette Ollikainen, Fysiikan opettajien argumentointi (The argumentation of physics teachers), 2013

- Mirja-Riitta Marjala, Fysiikan opetusharjoittelijoiden oppituntien rakenne ja tavoitteet painekäsitteen yhteydessä (The structure and goals of physics teacher trainees' lessons in context of pressure concept), 2014
- Markus Mattila, Studerandes förklaringsmodeller gällande glödlampors ljusstyrka i likströmskretsar (Students' explanation models of brightnesses of bulbs in DC-circuits), 2015
- Iida Kyyrönen, Todistaminen lukiossa (Proofing in upper secondary school) (initial title), ongoing

## 11. Other academic merits

- Pre-examiner of doctoral thesis: Juhani Vaskuri, Oppiennätyksistä opetussuunnitelman perusteisiin – lukion kemian kansallisen opetussuunnitelman kehittyminen Suomessa vuosina 1918 – 2016 (From Syllabus to the Frame Curriculum – Development of National Chemistry Curriculum in High School in Finland 1918 – 2016), 2017, University of Jyväskylä
- Pre-examiner of licentiate's thesis: Toni Purontaka, Modeling Concept Maps Done by Physics Students, 2013, University of Jyväskylä
- Adjunct professor (Title of docent): Didactical physics, Tampere University of Technology, 1.11.2016
- Membership(s): National work group of qualification standards for subject teacher education in mathematics and science, 2014-2017
- Referee:
  - *Scientific journals*: Eurasia Journal of Mathematics, Science and Technology Education 2015-2017; Journal of the Learning Sciences 2015-2016; Learning and Individual Differences, 2017; Physical Review ST Physics Education Research 2015-2016; Science & Education 2013-2017, LUMAT 2013,
  - *Scientific conference proceedings*: The proceedings of Annual Conference of Finnish Mathematics and Science Education Research Association 2010, 2015; The proceedings of annual conference on subject didactics 2012.
  - *Conference proposals*: European Science Education Research Association ESERA 2015, 2017, First European Regional International History, Philosophy and Science Teaching Group Conference 2016, European Society for Engineering Education SEFI 2016, EARLI 2017, JURE 2017.
- Member of organizing committees of conferences:
  - EARLI 2017, 29.8.-2.9.2017
  - 1st European Regional IHPST Conference 22.08.2016-25.08.2016. Flensburg, Germany (scientific committee)
  - Cognitive and Computational Modeling of Conceptual Change in Learning Science and Science Education, Science workshop funded by Finnish Cultural Foundation, 2012-2013, 5 workshops
  - 2nd Nordic Regional Meeting of the International History and Philosophy of Science in Science Teaching (IHPST) Group, October 2012, Helsinki
  - NorSEd research school on History and Philosophy of Science in Science Education, October 2012, Helsinki
  - The annual conference Finnish Mathematics and Science Education Research Association, November 2011, Helsinki
  - Joint Summer School of Mathematics, Physics and Chemistry Education Graduate Schools (Germany and Finland), June 2008, Helsinki
- Administrative responsibilities at higher education institutions:
  - Member of Tampere3 STEM working group, 2016
  - Member of Faculty council (Faculty of Education), 1.1.2017-31.12.2019

- Member of the scientific committee of the Faculty of Education, 1.1.2017-31.1.2019
- Memberships within the School of Education: Executive group, Oct – Dec 2016; Development of instruction -group 2015-2016; Pedagogic team (chair) 2015-2016; Advisory board of Teacher training school (vice-chair) 2015-2017; Teaching practicum group 2016; Upper secondary school at university –group 2016-2017
- Invited keynote lectures abroad
  - 2016 Physics Teacher Education Coalition Conference, 11.-13.3.2016, Baltimore, Yhdysvallat (invited by Monica Plisch, Associate Director of Education and Diversity, American Physical Society)
  - “SNU-HU-NTNU Joint Symposium & Synergies Symposium”, 17.-18.12.2013, Seoul, South-Korea (invited by prof. Eizo Ohno, Hokkaido University)
  - Invited symposium lecture in ”Current Issues in the Professional Preparation of Physics Teachers”, ESERA 2013 Conference, 2.-7.9.2013, Nicosia, Cyprus (invited by prof. Stamatis Vokos, Seattle University)

## 12. Publications

### REFEREED JOURNAL ARTICLES

10. Kokkonen, T., & **Mäntylä, T.** (forthcoming). Changes in University Students' Explanation Models of DC circuits. *Research in Science Education*, doi: 10.1007/s11165-016-9586-y
9. Evagorou, M., Erduran, S., & **Mäntylä, T.** (2015). The Role of Visual Representations in Scientific Practices: From Conceptual Understanding and Knowledge Generation to 'Seeing' how Science Works. *International Journal of STEM Education* 2(11), 1-13.
8. **Mäntylä, T.**, & Hämmäläinen, A. (2015). Obtaining laws through quantifying experiments: Justifications of pre-service physics teachers in the case of electric current, voltage and resistance. *Science & Education*, 24(5-6), 699-723.
7. **Mäntylä, T.**, & Nousiainen, M. (2014). Consolidating Pre-Service Physics Teachers' Subject Matter Knowledge Using Didactical Reconstructions. *Science & Education*, 23(8), 1583-1604.
6. **Mäntylä, T.** (2013). Promoting Conceptual Development in Physics Teacher Education: Cognitive-Historical Reconstruction of Electromagnetic Induction Law. *Science & Education*, 22(6), 1361-1387.
5. **Mäntylä, T.** (2012). Didactical reconstruction of processes in knowledge construction: Pre-service physics teachers learning the law of electromagnetic induction. *Research in Science Education*, 42(4), 791-812.
4. Majidi, S., & **Mäntylä, T.** (2011). Knowledge organization in physics textbooks: A case study of magnetostatics. *Journal of Baltic Science Education*, 10(4), 285-299.
3. **Mäntylä, T.**, & Koponen, I. T. (2007). Understanding the role of measurements in creating physical quantities: a case study of learning to quantify temperature in physics teacher education. *Science & Education*, 16, 291-311.

2. Koponen, I. T., & **Mäntylä, T.** (2006). Generative role of experiments in physics and in teaching physics: A suggestion for epistemological reconstruction. *Science & Education, 15*, 31-54.
1. Koponen, I. T., **Mäntylä, T.**, & Lavonen, J. (2004). The role of physics departments in developing student teachers' expertise in teaching physics. *European Journal of Physics, 25*(5), 645-653.

#### REFEREED ARTICLES IN BOOKS OR CONFERENCE PROCEEDINGS

9. Karam, R., & **Mäntylä, T.** (2015). The influence of mathematical representations on students' conceptualizations of the electrostatic field. In F. Claudio, & R. M. Sperandeo Mineo (Eds.): *Teaching/Learning Physics: Integrating Research into Practice: Proceedings of the GIREP-MPTL 2014 International Conference*. Palermo: Dipartimento di Fisica e Chimica, Università degli Studi di Palermo (819-826).
8. Kauhanen, H., Kokkonen, T., Lappi, O., & **Mäntylä, T.** (2014). Semi-automatic derivation of conceptual graphs from interview transcripts using key term co-occurrence relations. In A-S. Røj-Lindberg, L. Burman, B. Kurtén-Finnäs, & K. Linnanmäki (Eds.): *Spaces for learning: past, present and future: Proceedings of the 30th annual symposium of the Finnish Mathematics and Science Educations Research Association*. Reports from the Faculty of Education; Nro 36 (99-114).
7. **Mäntylä, T.** (2012). Guided collaboration in making flow charts in physics teacher education. In Krzywacki, H., Juuti, K., & Lampiselkä, J. (Eds.) *Matematiikan ja luonnontieteiden opetuksen ajankohtaista tutkimusta. Ainedidaktisia julkaisuja 2. [Current research in mathematics and science. Publications in subject didactics 2.]* Helsinki: Unigrafia (63-79).
6. Majidi, S. & **Mäntylä T.** (2012). Teachers subject matter content knowledge: Case study of Biot-Savart law and Ampère's law. In Krzywacki, H., Juuti, K., & Lampiselkä, J. (Eds.) *Matematiikan ja luonnontieteiden opetuksen ajankohtaista tutkimusta. Ainedidaktisia julkaisuja 2. [Current research in mathematics and science. Publications in subject didactics 2.* Helsinki: Unigrafia (45-61).
5. Majidi, S., & **Mäntylä, T.** (2011) Knowledge Organization in University Physics Textbooks. In Silfverberg, H., & Joutsenlahti, J. (Eds.) *Integrating Research into Mathematics and Science Education in the 2010s: Annual Symposium of the Finnish Mathematics and Science Education Research Association*.
4. Pehkonen, M., Koponen, I., & **Mäntylä, T.** (2009). Collaborative Concept Mapping by Using CmapTools: Supporting Conceptualisation and Learning in Higher Education. In Méndez Vilas, A., Solano Martín, A., Mesa González, J., & Mesa González, J. A. (Eds): *Research, Reflections and Innovations in Integrating ICT in Education: The proceedings of 5th International Conference on Multimedia and Information and Communication Technologies in Education* (347-351).
3. Koponen, I. T., & **Mäntylä, T.** (2006). Models and modelling in physics education: a review of philosophical underpinnings. In *Pathways into research-based teaching and learning in mathematics and science education*. Jyväskylä: Jyväskylän yliopisto (19-27).

2. **Mäntylä, T.**, & Koponen, I. (2004). Conceptual hierarchy of physics leading to structured knowledge in physics teacher education. In Laine, A., Lavonen, J., & Meisalo, V. (Eds.): *The proceedings of the XXI Annual Symposium of the Finnish Association of Mathematics and Science Education Research: Current research on mathematics and science education*. University of Helsinki, Department of Applied Sciences of Education. Research Report 253. Helsinki: Yliopistopaino (370-390).
1. Koponen, I. T., **Mäntylä T.**, & Lavonen, J. (2002). Challenges of web-based education in physics teacher training. In *Proceedings of ICTE 2002 conference*, Badajoz (291-295).

#### **NON-REFEREED ARTICLES IN CONFERENCE PROCEEDINGS**

2. Majidi, S. & **Mäntylä T.** (2012). Subject Matter Content Knowledge and Representation Strategies of Physics Teachers: Biot-Savart Law and Ampère's Law. In *Proceedings of NARST 2012 Conference*. Indiana.
1. Lavonen, J., Koponen, I. T., & **Kortesniemi, T.** (2002). Learning by Making Network Presentations Collaboratively: Case Study in Physics Teacher Education. In *Proceedings of GIREP 2002 Conference*. Lund.

#### **13. Positions of trust in society and other societal merits**

- Associate member (physics section) of Finnish Matriculation Board, fall 2014-