

State of the art: Current and consolidated research in maths teacher education (10 ECTS points)
COURSE PLAN (2022-03-17)

Scope – 10 ECTS points

Level of education – Graduate and research level

Subject – Education

Area of education - Educational sciences

Course objectives – The course aims to introduce and provide students' opportunities to engage in critical reasoning on (a) research on the work of teachers in mathematics classrooms, (b) research on mathematics teacher knowledge, beliefs and identity in relation to teacher education, (c) research on practice-based mathematics teacher education.

Learning objectives

- Demonstrate knowledge on the work of teachers in mathematics classrooms
- Engage in critical reasoning on mathematics teacher knowledge, beliefs and identity
- Engage in critical reasoning on research on practice-based mathematics teacher education

Course content

- research on the work mathematics teachers including aspects of student learning, mathematical classroom practices and teachers' instructional practices.
- research on mathematics teacher knowledge, beliefs and identity in relation to teacher education
- research on practice-based mathematics teacher education including different educational practices within teacher education internationally and trends in research methodologies and theories on mathematics teacher education practices.

Examinator: Andreas Ryve

Course leaders : Andreas Ryve, Jeppe Skott, Jannika Lindvall, Maria Larsson and Iben Christiansen.

Examinations:

INL1, 2 Credits, Pass (G) (Before session 1)
INL2, 2 Credits, Pass (G) (Before session 2)
INL3, 4 Credits, Pass (G) (After both sessions)
SEM1, 1 credits Pass (G) (Session 1)
SEM2, 1 credits Pass (G) (Session 2)

Grade Marks

Pass (G)

Prerequisites and registration

Researchers and research students enrolled in mathematics education or equivalent education.

Additional information

The course includes sessions requiring mandatory attendance. Parts of the course can be delivered online.

Literature

- Ball, D., & Cohen, D. (1999). Developing practice, developing practitioners: Toward a practice-based theory of professional education. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as the Learning Profession* (pp. 3-32). Jossey-Bass.
- Ball, D.L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education*, 59, 389-407.
- Christiansen, I. M., & Erixon, E. L. (2021). Opportunities to learn mathematics pedagogy and learning to teach mathematics in Swedish mathematics teacher education: A survey of student experiences. *European Journal of Teacher Education*, 1-19.
- Corey, D. L., Peterson, B. E., Lewis, B. M., & Bukarau, J. (2010). Are there any places that students use their heads? Principles of high-quality Japanese mathematics instruction. *Journal for Research in Mathematics Education*, 41(5), 438-478.
- Darling-Hammond, L., & Lieberman, A. (2012). Teacher education around the world: What can we learn from international practice? In L. Darling-Hammond & A. Lieberman (Eds.), *Teacher education around the world: Changing policies and practices* (pp. 151-169). Oxon: Routledge.
- Depaepe, F., Verschaffel, L., & Kelchtermans, G. (2013). Pedagogical content knowledge: A systematic review of the way in which the concept has pervaded mathematics educational research. *Teaching and Teacher Education*, 34, 12-25.

- Fives, H., & Buehl, M. M. (2012). Spring cleaning for the messy construct of teachers' beliefs: What are they? Which have been examined? What can they tell us? In K. R. Harris, S. Graham, & T. Urdan (Eds.), *APA Educational Psychology Handbook* (Vol. 2. Individual differences and cultural and contextual factors, pp. 471-499). APA.
- Forzani, F. M. (2014). Understanding “Core Practices” and “Practice-Based” Teacher Education: Learning From the Past. *Journal of Teacher Education*, 65(4), 357-368.
- Grossman, P., & McDonald, M. (2008). Back to the future: Directions for research in teaching and teacher education. *American Educational Research Journal*, 45(1), 184–205.
- Goldsmith, L. T., Doerr, H. M., & Lewis, C. C. (2014). Mathematics teachers' learning: a conceptual framework and synthesis of research. *Journal of Mathematics Teacher Education*, 17, 5-36.
- Hiebert, J., & Grouws, D. A. (2007). The effects of classroom mathematics teaching on students' learning. In F. K. Lester (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 371-404). Greenwich, CT: Information Age.
- Jacobs, V. R., & Spangler, D. A. (2017). Research on core practices in K–12 mathematics teaching. In J. Cai (Ed.), *Compendium for research in mathematics education* (pp. 766–792). National Council of Teachers of Mathematics.
- Janssen, F., Grossman, P., & Westbroek, H. (2015, 2015/10/01/). Facilitating decomposition and recomposition in practice-based teacher education: The power of modularity. *Teaching and Teacher Education*, 51, 137-146. <https://doi.org/https://doi.org/10.1016/j.tate.2015.06.009>
- Kennedy, M. M. (2016). How does professional development improve teaching?. *Review of Educational Research*, 86(4), 945-980. doi:10.3102/0034654315626800.
- Krauss, S., Brunner, M., Kunter, M., Baumert, J., Blum, W., Neubrand, M., & Jordan, A. (2008). Pedagogical content knowledge and content knowledge of secondary mathematics teachers. *Journal of educational psychology*, 100(3), 716.
- Kleickmann, T., Richter, D., Kunter, M., Elsner, J., Besser, M., Krauss, S., & Baumert, J. (2013). Teachers' content knowledge and pedagogical content knowledge: The role of structural differences in teacher education. *Journal of teacher education*, 64(1), 90-106.
- Lutovac, S., & Kaasila, R. (2018, February 03). Future directions in research on mathematics-related teacher identity. *International Journal of Science and Mathematics Education*(16), 759-776. <https://doi.org/10.1007/s10763-017-9796-4>
- McDonald, M., Kazemi, E., & Kavanagh, S. S. (2013). Core Practices and Pedagogies of Teacher Education: A Call for a Common Language and Collective Activity. *Journal of Teacher Education*, 64(5), 378-386. <https://doi.org/10.1177/0022487113493807>
- Munter, C. (2014). Developing visions of high-quality mathematics instruction. *Journal for Research in Mathematics Education*, 45(5), 584–635.
- Munter, C., Stein, M. K., & Smith, M. A. (2015). Dialogic and direct instruction: Two distinct models of mathematics instruction and the debate(s) surrounding them. *Teachers College Record*, 117(11), 1–32.
- Opfer, V. D., & Pedder, D. (2011). Conceptualizing teacher professional learning. *Review of educational research*, 81(3), 376-407.
- Rowland, T., Huckstep, P., & Thwaites, A. (2005). Elementary teachers' mathematics subject knowledge: The knowledge quartet and the case of Naomi. *Journal of Mathematics Teacher Education*, 8, 255–281.
- Ryve, A., Nilsson, P., & Mason, J. (2012). Establishing mathematics for teaching within classroom interactions in teacher education. *Educational Studies of Mathematics*, 81, 1-14.

- Ryve, A. (2007). What is actually discussed in problem-solving courses for prospective teachers? *Journal of Mathematics Teacher Education*, 10, 43-61.
- Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 1-22
- Shulman, L. S., & Shulman, J. H. (2009). How and what teachers learn: A shifting perspective. *Journal of Education*, 189(1-2), 1-8.
- Skott, J. (2015). Towards a participatory approach to 'beliefs' in mathematics education. In B. Pepin & B. Rösken (Eds.), *From beliefs to dynamic affect systems in mathematics education. Exploring a mosaic of relationships and interactions* (pp. 3-23). Springer.
- Skott, J. (2019). Changing experiences of being, becoming, and belonging: teachers' professional identity revisited *ZDM - The International Journal on Mathematics Education*, 51(3), 469-480. <https://doi.org/10.1007/s11858-018-1008-3>
- Skott, J. (forthcoming). Conceptualizing individual-context relationships in teaching: Developments in research on teachers' knowledge, beliefs and identity. CERME 12, Bolzano.
- Stein, M., Engle, R., Smith, M., & Hughes, E. (2008). Orchestrating productive mathematical discussions: Five practices for helping teachers move beyond show and tell. *Mathematical Thinking and Learning*, 10, 313-340
- Tatto, M. T., R. Peck, J. Schwille, K. Bankov, S. L. Senk, M. Rodriguez, L. Ingvarson, M. Reckase, and G. Rowley. 2012. Policy, Practice, and Readiness to Teach Primary and Secondary Mathematics in 17 Countries: Findings from the IEA Teacher Education and Development Study in Mathematics (TEDSMM). Amsterdam, The Netherlands: International Association for the Evaluation of Educational Achievement.

COURSE SCHEDULE

When.

- 1) 23rd of March 09.00-10.00 – Course information
- 2) 4-7th april at Mälardalen University. The 4th is an introduction day to the graduate school of REMTH, the 5-7th is the course days.
- 3) 31st of May- 2th of June
- 4) 14th of June (half day reading and commenting upon each other's final assessment task)

How Lectures, assessments, seminars, presentations. Written tasks both before and after each course meeting.

Schedule

5th of April

09.00-09.45 Course introduction (Andreas Ryve)

09.45-10.15 Break

10.15-11.45 How to read and write research articles in mathematics education (Andreas Ryve)

11.45-13.00 Lunch

13.00-15.30 Seminar of students' knowledge, learning of mathematics and classroom practices (Andreas Ryve)

6th of April

08.30-09.45 Lecture on ambitious classroom practice and teacher actions (Maria Larsson)

09.45-10.15 Break

10.15-12.00 Seminar on ambitious classroom practice and teacher actions (Maria Larsson)

12.00-13.00 Lunch

13.00-14.00 Lecture on teacher knowledge and knowing (Jeppe Skott)

14.00-14.30 Break

14.30-16.00 Seminar on teacher knowledge and knowing (Jeppe Skott)

7th of April

08.30-09.45 Lecture on teacher beliefs and identity (Jeppe Skott)
09.45-10.15 Break
10.15-12.00 Seminar on teacher beliefs and identity (Jeppe Skott)
12.00-12.30 Wrap up and next course meeting (Andreas Ryve)

Second session 31st of May to 2th of June

31st of May

09.00-09.45 Session introduction
09.45-10.15 Break
10.15-11.45 International perspectives on mathematics teacher education including Sweden (Iben)
11.45-13.00 Lunch
13.00-15.30 Seminar on International perspectives (Iben)

1st of June

08.30-09.45 Prospective teachers' learning (Jannika Lindvall)
09.45-10.15 Break
10.15-12.00 Seminar on prospective teachers' learning (Jannika Lindvall)
12.00-13.00 Lunch
13.00-14.00 Lecture mathematics teacher education practices (Andreas Ryve)
14.00-14.30 Break
14.30-16.00 Seminar on mathematics teacher education practices (Andreas Ryve)

2th of June

08.30-09.45 Seminar on designing practice-based mathematics teacher education
09.45-10.15 Break
10.15-11.30 Wrap up and introduction of final examination (Andreas Ryve)
12.00-13.00 Lunch

Third session 14th of June

08.30-12.30 Seminar on final examination tasks (students read other students' work and give feedback before they submit their final versions)

Submission of final examination task 20th of June 12.00

INSTRUCTIONS FOR THE STUDENTS

5TH OF APRIL TO 6TH OF APRIL UNTIL LUNCH (SESSION WITH ANDREAS RYVE AND MARIA LARSSON)

Reading

- Corey, D. L., Peterson, B. E., Lewis, B. M., & Bukarau, J. (2010). Are there any places that students use their heads? Principles of high-quality Japanese mathematics instruction. *Journal for Research in Mathematics Education*, 41(5), 438-478.
- Hiebert, J., & Grouws, D. A. (2007). The effects of classroom mathematics teaching on students' learning. In F. K. Lester (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 371-404). Greenwich, CT: Information Age.
- Jacobs, V. R., & Spangler, D. A. (2017). Research on core practices in K–12 mathematics teaching. In J. Cai (Ed.), *Compendium for research in mathematics education* (pp. 766–792). National Council of Teachers of Mathematics.
- Munter, C. (2014). Developing visions of high-quality mathematics instruction. *Journal for Research in Mathematics Education*, 45(5), 584–635.
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- Stein, M., Engle, R., Smith, M., & Hughes, E. (2008). Orchestrating productive mathematical discussions: Five practices for helping teachers move beyond show and tell. *Mathematical Thinking and Learning*, 10, 313–340

6TH OF APRIL FROM LUNCH TO 7TH OF APRIL (SESSION WITH JEPPE SKOTT)

Reading

- Ball, D.L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education*, 59, 389-407.
- Depaepe, F., Verschaffel, L., & Kelchtermans, G. (2013). Pedagogical content knowledge: A systematic review of the way in which the concept has pervaded mathematics educational research. *Teaching and Teacher Education*, 34, 12-25.
- Fives, H., & Buehl, M. M. (2012). Spring cleaning for the messy construct of teachers' beliefs: What are they? Which have been examined? What can they tell us? In K. R. Harris, S. Graham, & T. Urdan (Eds.), *APA Educational Psychology Handbook* (Vol. 2. Individual differences and cultural and contextual factors, pp. 471-499). APA.
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- Kleickmann, T., Richter, D., Kunter, M., Elsner, J., Besser, M., Krauss, S., & Baumert, J. (2013). Teachers' content knowledge and pedagogical content knowledge: The role of structural differences in teacher education. *Journal of teacher education*, 64(1), 90-106.

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- Rowland, T., Huckstep, P., & Thwaites, A. (2005). Elementary teachers' mathematics subject knowledge: The knowledge quartet and the case of Naomi. *Journal of Mathematics Teacher Education*, 8, 255–281.
- Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 1–22
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- Skott, J. (forthcoming). Conceptualizing individual-context relationships in teaching: Developments in research on teachers' knowledge, beliefs and identity. CERME 12, Bolzano.

31ST OF MAY (SESSION WITH IBEN CHRISTIANSEN)

Reading

- Christiansen, I. M., & Erixon, E. L. (2021). Opportunities to learn mathematics pedagogy and learning to teach mathematics in Swedish mathematics teacher education: A survey of student experiences. *European Journal of Teacher Education*, 1-19.
- Corey, D. L., Peterson, B. E., Lewis, B. M., & Bukarau, J. (2010). Are there any places that students use their heads? Principles of high-quality Japanese mathematics instruction. *Journal for Research in Mathematics Education*, 41(5), 438-478.
- Tatto, M. T., R. Peck, J. Schwille, K. Bankov, S. L. Senk, M. Rodriguez, L. Ingvarson, M. Reckase, and G. Rowley. 2012. Policy, Practice, and Readiness to Teach Primary and Secondary Mathematics in 17 Countries: Findings from the IEA Teacher Education and Development Study in Mathematics (TEDSMM). Amsterdam, The Netherlands: International Association for the Evaluation of Educational Achievement.

1ST OF JUNE (SESSION WITH JANNIKA LINDVALL AND ANDREAS RYVE)

Reading

- Forzani, F. M. (2014). Understanding “Core Practices” and “Practice-Based” Teacher Education: Learning From the Past. *Journal of Teacher Education*, 65(4), 357-368.
- Grossman, P., & McDonald, M. (2008). Back to the future: Directions for research in teaching and teacher education. *American Educational Research Journal*, 45(1), 184–205.

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- McDonald, M., Kazemi, E., & Kavanagh, S. S. (2013). Core Practices and Pedagogies of Teacher Education: A Call for a Common Language and Collective Activity. *Journal of Teacher Education*, 64(5), 378-386. <https://doi.org/10.1177/0022487113493807>
- Opfer, V. D., & Pedder, D. (2011). Conceptualizing teacher professional learning. *Review of educational research*, 81(3), 376-407.
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- Ryve, A. (2007). What is actually discussed in problem-solving courses for prospective teachers? *Journal of Mathematics Teacher Education*, 10, 43-61.
- Shulman, L. S., & Shulman, J. H. (2009). How and what teachers learn: A shifting perspective. *Journal of Education*, 189(1-2), 1-8.

2ND OF JUNE

Reading

- Ball, D., & Cohen, D. (1999). Developing practice, developing practitioners: Toward a practice-based theory of professional education. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as the Learning Profession* (pp. 3-32). Jossey-Bass.
- Darling-Hammond, L., & Lieberman, A. (2012). Teacher education around the world: What can we learn from international practice? In L. Darling-Hammond & A. Lieberman (Eds.), *Teacher education around the world: Changing policies and practices* (pp. 151-169). Oxon: Routledge.