

THE EDUCATION UNIVERSITY OF HONG KONG

Course Outline

Part I

Programme Title	: Doctor of Education (Mathematics Education – Directed Study)
Course Title	: MATH 4 – Research and Issues in Mathematics Teacher Education
Course Code	: MTH8125
Department	: Mathematics and Information Technology
Credit Points	: 3
Course Hours	: 39 hours
Pre-requisite(s)	: MATH 1 and MATH 2
Level	: Applied Stage

Part II

1. Synopsis

This course will expose candidates to different aspects of competence of mathematics teachers. Developing theories on measuring mathematics competence of pre-service and in-service teachers will be introduced and investigated. Candidates will explore on how to enrich pedagogical content knowledge without losing the rigor of mathematics content in classroom practices.

2. Course Intended Learning Outcomes (CILOs)

Upon completion of this course, students will be able to:

- CILO₁ identify issues and select approaches to analyze the issues and related implications;
- CILO₂ execute international comparison methods on teachers' and pre-service teachers' competence between two or among several groups;
- CILO₃ apply research procedures appropriate for investigations in this research area;
- CILO₄ plan, execute and report on a small scale research project in a selected area of the field.

3. Content, CILOs and Teaching & Learning Activities

Course Content	CILOs	Suggested Teaching & Learning Activities
Critical understanding and knowledge with respect to the implementation of assessment methodology to identify the competence of mathematics teachers in mathematics for teaching, pedagogical content knowledge, subject matter knowledge and curriculum	CILO _{1,2}	<ul style="list-style-type: none">• Lecturer-led Q&A• Guided Research Activities

knowledge		
Design research methods and instruments to undertake evaluations of teachers' competence, professionalism and handling of ethical issues in mathematics education	<i>CILO</i> _{1,2,3}	<ul style="list-style-type: none"> • Guided Research Activities
Critical analysis of research literature on mathematics teachers' competencies	<i>CILO</i> _{3,4}	<ul style="list-style-type: none"> • Guided Research Activities
Implementation of the research designs and procedures	<i>CILO</i> _{2,3}	<ul style="list-style-type: none"> • Guided Research Activities
Data analyses including ethnographic and quantitative approaches	<i>CILO</i> _{3,4}	<ul style="list-style-type: none"> • Lab Work • Presentation
Discussion of the results and rationalization for further applications	<i>CILO</i> ₄	<ul style="list-style-type: none"> • Presentation

4. Assessment

Assessment Tasks	Weighting (%)	CILO
Candidates are required to submit a 5000-6000 words project on a relevant topic of their interest in either primary or secondary mathematics teachers' knowledge competencies. The project will involve literature review on current developments and issues, methodology and design of proper instruments of investigation, qualitative/quantitative analyses, and implications of the findings. An oral presentation of the project is required.	100%	<i>CILO</i> _{1,2,3,4}

5. Required Text(s)

Nil

6. Recommended Readings

- Adler, J., Ball, D.L., Krainer, K., Lin, F.-L., & Novotna, J. (2005). Reflections on an emerging field: Researching mathematics teacher education. *Educational Studies in Mathematics*, 60, 359–381.
- Ball, D. L., Hill, H., & Bass, H. (2005). Knowing mathematics for teaching. *American Educator*, 29(3), 14-46.
- Ball, D. L. (1998). The Subject Matter Preparation of perspective teachers: Challenging the Myths. *National Center for Research in Teacher Education*. East Lansing.
- *Bromme, R. (1994). Beyond subject matter: A psychological topology of teachers' professional knowledge. In Rolf Biehler et al. (Eds.), *Didactics of Mathematics as a Scientific Discipline* (pp. 73-88). Dordrecht: Kluwer Academic Publishers.
- Hill, H. C., Blunk, M. L., Charalambous, Y. C., Lewis, J. F., Phelps, G. C., Sleep, L. & Ball, D. L. (2008). Mathematics knowledge for teaching and the mathematics quality of instruction: An exploratory study. *Cognition and Instruction*, 26, 430-511.
- Leung, Issic K.C. & Lew, Hee-chan (2012). The ability of students and teachers to use counter

- examples to justify mathematical propositions: A pilot study in South Korea and Hong Kong. *ZDM - The International Journal on Mathematics Education*. 45(1), 91-105.
- Leung, Issic K.C. & Carbone, E. R. (2013). Pre-service Teachers' Knowledge about Fraction Divisions Reflected Through Problem Posing. *The Mathematics Educator*. 14(1&2), 1-20.
- Leung, Issic. K. C., Wong, N. Y., Schwarz, B., Cheung, K. L., Chan, W. S. and Kaiser, G. (2013). Competency of Prospective Chinese Mathematics Teachers on Mathematical Argumentation and Proof. *The Mathematics Educator*, 15(1), 81-97.
- *Ma, Liping (1999). *Knowing and Teaching Elementary Mathematics: Teachers' Understanding of Fundamental Mathematics in China and the United States* (Studies in Mathematical Thinking and Learning). Lawrence Erlbaum Associates, Inc.
- Mason, J. (2011). Phenomenology of example construction. *ZDM-International Journal on Mathematics Education*, 43(2), 195-204.
- Mayer, R. E. (1998). Cognitive, Metacognitive, and Motivational Aspects of Problem Solving. *Instructional Science*, 26, 49-63.
- *Mayer, R. E. (2003). *Learning and Instruction*. Upper Saddle River, New Jersey: Pearson Education, Inc.
- *Pressley, M. (1990). *Cognitive Strategy Instruction*. Cambridge, MA: Brookline Books.
- Rowland, T., Martyn, S., Barber, P, & Heal, C. (2000). Primary teacher trainees' mathematics subject knowledge and classroom performance. In T. Rowland & C. Morgan (Eds.), *Research in Mathematics Education* (Vol. 2, pp. 3–18). London: British Society for Research into Learning Mathematics.
- Rowland, T., Turner, F., Thwaites, A. and Huckstep, P. (2009). *Developing Primary Mathematics Teaching: reflecting on practice with the Knowledge Quartet*. London: Sage Publications.
- *Schmidt, W., Tatto, M.T., Bankov, K., Blömeke, S., Cedillo, T., Cogan, L. et al. (2007). *The preparation gap: teacher education for middle school mathematics in six countries (MT21 report)*. East Lansing: Michigan State University.
- Shulman, L. S. (1986). Those who understand. Knowledge growth in teaching. In *Educational Researcher* 15, 4-14.
- Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*. 57,1-22.
- Silkula, L.S. (1996). *Handbook of research on teacher education*. (2nd edition). New York, NY: Macmillan.
- Townsend, T. & Hates, R. (Eds.)(2007). *Handbook of teacher education: Globalization, Standards and professionalism in times of changes*. New York, NY: Springer
- Wong, N. Y. (2004). The CHC learner's phenomenon: Its implications on mathematics education. In L. Fan, N. Y. Wong, J. Cai, & S. Li (Eds.), *How Chinese learn mathematics: Perspectives from insiders* (pp. 503–534). Singapore: World Scientific.
- Wong, N. Y. (2006). From “entering the Way” to “exiting the Way”: In search of a bridge to span “basic skills” and “process abilities.” In F. K. S. Leung, G.-D. Graf, & F. J. Lopez-Real (Eds.), *Mathematics education in different cultural traditions: The 13th ICMI study* (pp. 111–128). New York, U.S.A.: Springer Verlag.
- Wong, N. Y., Han, J. W., & Lee, P. Y. (2004). The mathematics curriculum: Towards globalisation or Westernisation? In L. Fan, N. Y. Wong, J. Cai, & S. Li (Eds.), *How Chinese learn mathematics: Perspectives from insiders* (pp. 27–70). Singapore: World Scientific.

Those marked with () are highly recommended.*

7. Related Web Resources

- http://usteds.msu.edu/related_research.asp
- <http://qualitative-research.net/fqs/fqs-d/2-00inhalt-d.htm>

8. Related Journals

- *Journal of Teacher Education*
- *Educational Studies in Mathematics*
- *Learning and Instruction*
- *Teaching and Teacher Education*
- *ZDM-The International Journal on Mathematics Education*
- *Journal for Research in Mathematics Education*
- *The Mathematics Educator*

9. Academic Honesty

The University adopts a zero tolerance policy to plagiarism. For the University's policy on plagiarism, please refer to the *Policy on Academic Honesty, Responsibility and Integrity with Specific Reference to the Avoidance of Plagiarism by Students* (<https://www.eduhk.hk/re/modules/downloads/visit.php?cid=9&lid=89>). Students should familiarize themselves with the Policy.

10. Others

Nil

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