

MMTS101 Mathematics: Pedagogy and Assessment

ECTS Value: 6 ECTS
Self-Study Hours: 68

Contact Hours: 30
Assessment Hours: 52

Overall Objectives and Outcomes

Mathematics is a statutory part of most school curricula across the world. It is an intellectual achievement that optimises the power of reasoning and is a prerequisite for the learning of subjects such as Sciences, Technology, Engineering, Business and many more. These observations have implications on the necessity that all students should acquire mathematical skills. Also assessment should be used as a tool to ensure effective mathematics teaching and learning in classroom practice.

By the end of this module, the learner will be able to:

Competences:

- a. Organise and classify the maths curriculum into meaningful categories of mathematical knowledge and concepts;
- b. Identify and develop the underpinning mathematical content knowledge required for teaching in tandem with the development of mathematical pedagogical content knowledge required to teach secondary maths;
- c. Integrate a range of assessment methods into practice to promote learning for all students by designing, selecting and ethically employing assessments, formative as well as summative, that align with educational goals and provide opportunities for students to reflect on their strengths and weaknesses in order to revise, support and extend their individual performance;
- d. Determine the best possible maths teaching methodology to be adopted as well as the skills, processes and content being taught;
- e. Comprehensively identify and employ appropriate knowledge, skills and techniques to monitor student` learning using established protocols;

Knowledge:

- a. Critically structure opportunities for students to use appropriate mathematical discourse as they reason and solve problems. Communicating mathematically also requires a command in mathematical notation, vocabulary, symbols, formulae, models and diagrams which are necessary to make sense of mathematics.
- b. Reflect on the difficulties inherent in understanding and learning the maths language which can be implemented into the maths curriculum;
- c. Differentiate between the different forms of pedagogical practices and methods to sustain, enhance and innovate the existing good practices in maths learning, teaching and assessment;
- d. Create a variety of assessment instruments to monitor students` progress in understanding concepts and in developing skills and which should not to be confined to intermittent standardised tests.
- e. Demonstrate a general understanding of the field of philosophy of mathematics;

Skills:

- a. Develop a self-reflective approach to teaching to improve practice, meet professional and academic needs and reform procedure in light of new knowledge and insight;
- b. Inspire mathematics enthusiasm and motivation in the classroom which will intrinsically and extrinsically enrich the teaching practices and motivate students;
- c. Instigate the use of more informative feedback to promote assessment both as learning and for learning, to help students set goals, reflect on and evaluate their own learning;
- d. Deal with abstract concepts, analyse data, identifying patterns, solving problems, reason, testing conjectures, justification and proof and communicating results.
- e. Provide opportunities to increase students' achievements by raising the achievements of the best students whilst providing support to improve the performance of under-achieving students.
- f. Develop curriculum building skills and innovative practices to embrace an inclusive and divertive culture with an emphasis to cater for individual differences and strategies to foster mathematical thinking by all;
- g. Develop effective and innovative pedagogical approaches to complement and enhance established methodologies for effective teaching to master proficiency in mathematics;
- h. Develop approaches involving digital learning technologies, the use of concrete materials, problem solving, modelling, mathematical investigations, argumentation and proof;
- i. Develop opportunities to use mathematics in new and meaningful ways and create a stimulating and productive environment to empower students to do maths and acquire confidence in learning, doing, and
- j. understanding mathematics.
- k. Develop a research informed approach by associating mathematics to its history to connect what we teach to its past to enhance learning and encourage investigational activities;

Assessment Methods

This module will be assessed through: Assignment, Presentation and Resources

Suggested Readings

Core Reading List:

1. National Board for Professional Teaching Standards Mathematics Standards(2015) Mathematics Standards for teachers of students ages 11-18. Section to Standard II, 'Accomplished teachers'
2. Wiliam, D. Springer (2016) Leadership for Teacher Learning. Learning Science Int.
3. Finkel, D. (2016) Five principles of extraordinary maths thinking:
4. TEDxRainier: <https://www.youtube.com/watch?v=ytVneQUA5-c>
5. Ernest. P. (2018) What is the Philosophy of Mathematics
6. Education
7. National Council for Teachers of Mathematics, (2014). Principles to actions,
8. Ensuring Mathematical Success for all. NCTM
9. Blanke, B. (2018) Mathematics Discourse: Let the Kids talk! Professional
10. Resources Series. Shell Educational Publishing.
11. Foster, C. (2012). The Essential Guide to Secondary Mathematics : Successful
12. and Enjoyable Teaching and Learning. Routledge.

13. Beveridge, C. & Green, A., (2014). Teacher's Skills Tests for Dummies. John Wiley & Sons, Incorporated.
14. Boaler, J. (2016). How you can be good at math, and other surprising facts about learning. TEDxStanford. <https://www.youtube.com/watch?v=3icoSeGqQtY>.
15. Clewis, R. (2015). Reading Kant's Lectures. De Gruyter Inc.
16. Ernest, P., Sriraman, B. & Ernest, N. (2015). Critical Mathematics Education Theory, Praxis and Reality. Cognition, Equity & Society: Int. Perspectives Ser. Information Age Publishing, Incorporated.
17. Li, Y. & Hung, R. (2012). How Chinese Teach Mathematics and Improve Teaching. Studies in Mathematical Thinking and Learning Ser. Routledge.
18. Meaney, T, Trinick T& Fairhall U. (2012). Collaborating to Meet Language Challenges In Indigenous Mathematics Classrooms. Springer.
19. Orland-Barak, L. & Craig, C. (2014). International Teacher Education : Promising Pedagogies. Advances in Research on Teaching Ser. VOL. 22, Part A. Emerald Publishing Limited.
20. Palisoc, Dr. R. (2014). Math isn't hard, it's a language. TEDxManhattanBeach <https://www.youtube.com/watch?v=V6yixyIjcos>.
21. Roth, W. & Mukhopadhyay, S. (2012). Alternative Forms of Knowing in Mathematics: Celebrations of Diversity of Mathematical Practices. New Directions in Mathematics and Science Education Ser. Springer.
22. Sammons, L. (2015). Implementing Guided Math: Tools for Educational Leaders. Guided Math Ser. Shell Educational Publishing.
23. Sriraman, B., Cai, J., et al. (2014). Abstracts of The First Sourcebook on Asian Research in Mathematics Education: China, Korea, Singapore, Japan, Malaysia, India. Information Age Publishing, Incorporated.
24. Skovsmose, O. & Greer, B. (2012). Opening the Cage: Critique and Politics of Mathematics Education. New Directions in Mathematics and Science Education Ser. VOLUME 23. Sense Publishers.

Supplementary Reading List:

1. Christodoulou, D. (2017) Making Good Progress?: The future of Assessment for Learning.
2. Toh, T.L. (et al) (2019) Mathematics Education in Singapore
3. Boaler, J. (2016) Mathematical Mindsets, Changing Beliefs. Unleashing Students' potential through creative math, inspiring messaging and innovative Teaching.
4. Carey, B (2014) How we learn, Understanding , Learning and Cognitive Science.