The University of Hong Kong
Faculty of Education

Master of Education (MEd)
STEM Education

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This specialism aims to equip education students with an in-depth understanding of theoretical and practical issues surrounding STEM education. The specialism will explore philosophy, theories, learning design, technologies and policy at local and international level with respect to STEM. Specific theoretical constructs will be examined in the specialism, with a focus on developing further research agenda at graduate level, e.g., STEM literacies, learning design, levels of integration, computational thinking, and design thinking.

Who would benefit from this specialism?

This course aims at Education students across all levels of schooling and higher education. STEM has been implemented by the Education Bureau (EDB) in Hong Kong in Primary and Secondary schools, and universities around the world are actively promoting transdisciplinary education and research. Although, the specialisms might best relate to science, mathematics, and technology teachers, the current trend is to make better integration of STEM with arts and social studies. Therefore, teachers other than science mathematics and technology would also benefit from such a specialism. Professionals working in industries supporting STEM Education will also benefit from this specialism.

Mode of study:

The specialism is available in 1-year full-time and 2-year part-time modes of study.

Outline of the four specialist courses:

Course 1: Design Thinking and Education (6 credits)

The design has been practised for ages in the world: bridges and buildings, machines, automobiles, spaceships, monuments, metro systems, artwork, every-day things and many other solution-centric end-products. Innovative designers apply learning-centric creative practices to build meaningful, effective and robust solutions for education. Design is a way of thinking and approaching fundamental issues by using knowledge from across disciplines and developing a transdisciplinary methodology in solving problems facing us in the contemporary world and the future. Learning by design is an approach that can enable students to bring their disciplinary knowledge and methodologies together in STEM Education. Learning by design promotes design thinking, applying disciplinary concepts, transdisciplinary methodologies and technologies in problem-solving. As such, it is a pedagogical approach led by the design thinking process comprised of 6 distinct phases: emphasizing, defining, ideating, prototyping, testing and implementing innovative solutions.

Course 2: Emerging Technologies in STEM Education (6 credits)

This course explores a broad range of current and emerging tools, practices and themes in STEM education. Also, the course will review current and future research trends in emerging tools, practices and themes in STEM Education. The course begins by exploring the historical development of cross-disciplinary

integration in STEM education, in order to equip students with an overall picture on the types and trends of emerging technology used for delivering STEM education in the past, present and future classrooms.

Course 3: Learning, Teaching and Assessment in STEM Education (6 credits)

As an introductory course of the STEM education specialism, this course is aimed at looking at integrated STEM education from its trends, models and theoretical perspectives, conceptualising STEM and contextualising it within the education and broader society, and how these theories inform its learning, teaching and assessment. Particular focus will be given to the relevant learning approaches grounding learning designs for integrated STEM education (e.g., self-regulated learning, scientific investigation, inquiry-based learning, etc.) and the challenges encountered, especially when designing assessment plans for students, through case studies of related learning designs.

Course 4: STEM Across the Curriculum and the Society (6 credits)

Cross-disciplinary integration is a central concept to STEM education. This course is aimed at looking at various models and approaches (e.g. discipline-focused, interdisciplinary, transdisciplinary, STEAM, STREAM) for developing integrated STEM curricula, among and beyond STEM-related disciplines (e.g. arts, languages, and humanities etc) to strengthen the coherence and collaboration among teachers of different disciplines. Critical reviews of the various integrated STEM curricula in Hong Kong and abroad are included to facilitate students to appreciate the good practices, realise the challenges involved, and examine outcomes when learning in these ways. Students have opportunities to design and develop integrated STEM curricula for the learning and teaching contexts they are familiar with. Besides discussing STEM across the curriculum, the role of STEM education in modern society is also discussed to facilitate students to understand its implications for society.

Specialist elective: Computational Thinking and Education (6 credits)

Computational thinking has been considered one of the most important problem-solving competence in 21st century, and its cognitive process becomes fundamental to the development of human intelligence in solving advanced problems in STEM, for example, artificial intelligence and many other technologies are the outcomes of solving computational problems using computational thinking. Many educators and teachers may believe that computational thinking is equivalent to programming, which leads to the pure teaching of programming in schools. Computational thinking goes beyond programming skills, where the basic components that form its thinking process are not only for solving programming problems, but also empowering learners to be competent in dealing with interdisciplinary challenges in STEM. Computational thinking could also help learners develop other 21st century skills, such as creative thinking, communication, and collaboration. To equip learners with ability to solve computational-related problems existing in STEM, schools and teachers need to rethink what computational thinking is, and how computational thinking can be infused in school's STEM curriculum so that education can respond to the needs of future generation in dealing with computation-related issues. This course will offer students a stage to reimagine what computational thinking is and will be.

In addition to the four specialist core courses and a specialist elective, students will also have to complete:

- The compulsory core course Educational Issues and Research (6 credits);
- Two elective courses (6 credits each); and
- An option of a professional portfolio (12 credits) or a research project (12 credits).