

Course Description

MEDD8896 Computational Thinking and Education

Course description			
<p>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.</p>			
<p>Coursework / Examination ratio: <u>100</u> % Coursework, <u>0</u> % Examination</p>			
Course objectives			
<p>The course aims to help educational researchers and practitioners develop a comprehensive understanding the fundamental of computational thinking and its cognitive role in STEM problem solving. The course examines and explore the origin of computational thinking and its motives for cognitive development and educational impacts that contribute to the development of constructionism as a learning theory and its application of STEM learning. While block-based programming has been a common learning activity to help younger learners develop their computational thinking, other learning approaches (e.g. unplugged activities, robotics activities) that support the development of computational thinking will be discussed. Through collaborative learning environment and interactive seminars, students will identify different approaches to implement the computational thinking methods in schoolbased STEM curriculum. The societal impact and ethical implication of computational thinking on advanced technologies such as artificial intelligence will be introduced. Research agenda and educational policy of this emerging field of transdisciplinary education can be developed with computational thinking in this course.</p>			
Course learning outcomes			Aligned programme learning outcomes (PLOs)
1. Describe the importance of computational thinking in STEM curriculum and global education policy.			PLOs 1, 3
2. Identify and criticize development and implementation challenges and opportunities of STEM teaching and learning with computational thinking.			PLOs 2, 3, 4
3. Apply the theory of constructionism and other pedagogical approaches to design a constructionist learning environment that supports computational thinking in schools.			PLOs 2, 3, 5
Course assessment methods			
Assessment method	Type of assessment (e.g. description of assignment)	Weighting (%)	Aligned course learning outcome(s)
Weekly reflection	Individual	10	CLOs 1 & 2
Learning Design Project	Individual/Group	40	CLOs 1, 2, 3
Systemic Review Paper	Individual	50	CLOs 1, 3
Course content and topics			
<p>Course Introduction – What and Why? Problem solving as high-order thinking in STEM education – What are the challenges in research and practices? Historical development, constructionism as the learning theory, and cognitive development</p>			

Policy, curriculum development and professional development of computational thinking
Design of learning and assessment in computational thinking
Hands-on Workshop: Computational thinking education in practice I
Hands-on Workshop: Computational thinking education in practice II

Required / recommended readings and online materials

Readings are listed in Moodle.

Other additional course information

Nil