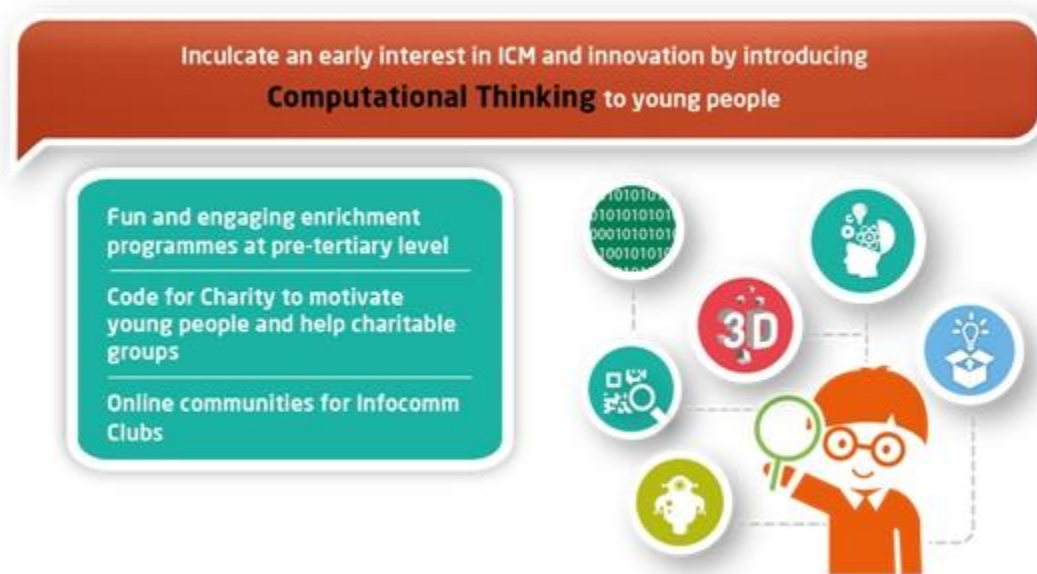


## Computational Thinking as a National Capability

With the increasing digitisation of our environment and reliance on the Internet, coding and computational thinking will be the new, important skills in the 21st century. Computational thinking is an approach to solving problems, building systems and understanding human behaviour that draws on the power and limits of computing. As coding is the language of computational thinking, learning to read and write this language may become as important as literacy in the more traditional language forms. Coding and computational thinking should be taught to all Singaporeans and made a national capability. This will enable our workforce, regardless of field or profession, to have the necessary skills to benefit from opportunities in the future.

We are targeting three groups of people: pre-tertiary students, tertiary students, and the general public. Some examples of the schemes and programmes that promote coding and computational thinking are suggested below:

### *Coding and Computational Thinking to be Taught to Pre-tertiary Students*



We propose to introduce coding and computational thinking for all levels from primary to post-secondary education: first as an enrichment programme and then possibly as part of the curriculum as countries like the UK have done. This will expose all students to computational thinking, and subsequently nurture a generation of workers equipped with important ICM skills.

As coding is generally perceived as a difficult skill to learn, teaching it in a fun and engaging manner can help change this prejudice. Students can be first exposed to simple and fun programming tools such as Scratch, before learning the concepts of computational thinking and its application to problem-solving. They can then progress to more advanced computational thinking concepts such as problem decomposition, pattern recognition, abstractions and algorithm design. Gamified learning can also tap on the creativity of students in building machines and robots to solve problems.

Co-curricular activities such as ICM-related clubs allow students who are more passionate about ICM to gain a deeper understanding of the subject. Industry partners can support these clubs by providing mentors, inspiring interested students with the future of infocomm and interactive digital media.

### ***Online Engagement Platform for Enhanced Learning***

For students to probe more deeply into specific ICT and digital media domains, we can develop online engagement platforms. The learning process can take the form of a game or a competition, with participants rewarded with badges after demonstrating an understanding of ICM concepts. These platforms will aggregate students interested in a particular ICM area and facilitate the formation of communities. ICM professionals can subsequently identify, nurture and mentor promising talents in these communities. To encourage students to further pursue their passion, we can organise national ICM competitions.

### ***Computer Science Minors for Non-computing Tertiary Students***

The convergence of ICM and non-ICM roles has led to a growing demand for hybrid professionals with both ICM skills and relevant domain knowledge. As coding is becoming an increasingly important job skill, tertiary students in non-ICM courses should be given the opportunity to pick up coding and computational thinking skills.

Hence, we propose promoting ICM as a relevant minor for non-ICM tertiary students including law, healthcare and business. This will help develop hybrid professionals with knowledge in their specialised domains and an adequate grasp of ICM skills. In addition, we can also offer general ICM courses useful for professionals in all fields, with subjects such as data analysis, modelling and simulation. For example, sales and marketing professionals can learn to build models and analyse data to improve their companies' bottom line.

### ***Code for Charity***

Young people are increasingly being motivated by purpose, such as a social or charitable cause. To tap on this spirit, we can organise a series of charity events and activities related to ICM. Participants will also learn how to code and find out more about the applications of coding.

Code for Charity can be conducted in two ways. First, we can help charity groups organise fundraising events involving ICM. People of all ages and from all walks of life can perform ICM-related tasks to unlock funds pledged by industry partners that will be donated to charity.

Second, we can develop applications for charity organisations to improve their efficiency. ICT and digital media professionals can team up with young coders to build ICM solutions. These solutions can range from creating websites using open-source content management systems to implementing complex accounting systems. By putting their coding skills to solve real world problems, young coders will realise the value of their skills.

### **Opportunities for the ICM Sectors**

With more people educated in coding and computational thinking, more companies will be aware of the opportunities provided by ICM. This can in turn lead to more demand for ICM solutions.