

STEM Education: Setting kids up for life

By Angela Baura

As a young boy, Timothy Stuart was always building things. From moulding toy soldiers by extracting the lead in car batteries to creating model villages and steam engines, he was inspired by his father – an engineer and innovator – to be curious, to think creatively and to create solutions. It was this approach to real-life learning that later drew Timothy to unit blocks – humble wooden blocks which, he recognised, presented infinite opportunities to engage and educate young minds. After years of research, design and testing, Timothy developed his own range of blocks which he named UnitBricks – a variety of realistic blocks in different shapes and sizes that surreptitiously promote early mathematics and engineering skills while children build bridges, skyscrapers, roller coasters or anything their inspiration desires. Praised by schools and universities the world over, UnitBricks embodies STEM education: an integrated approach to learning that draws upon Science, Technology, Engineering and Mathematics to foster problem-solving, discovery, critical thinking and innovation in students.

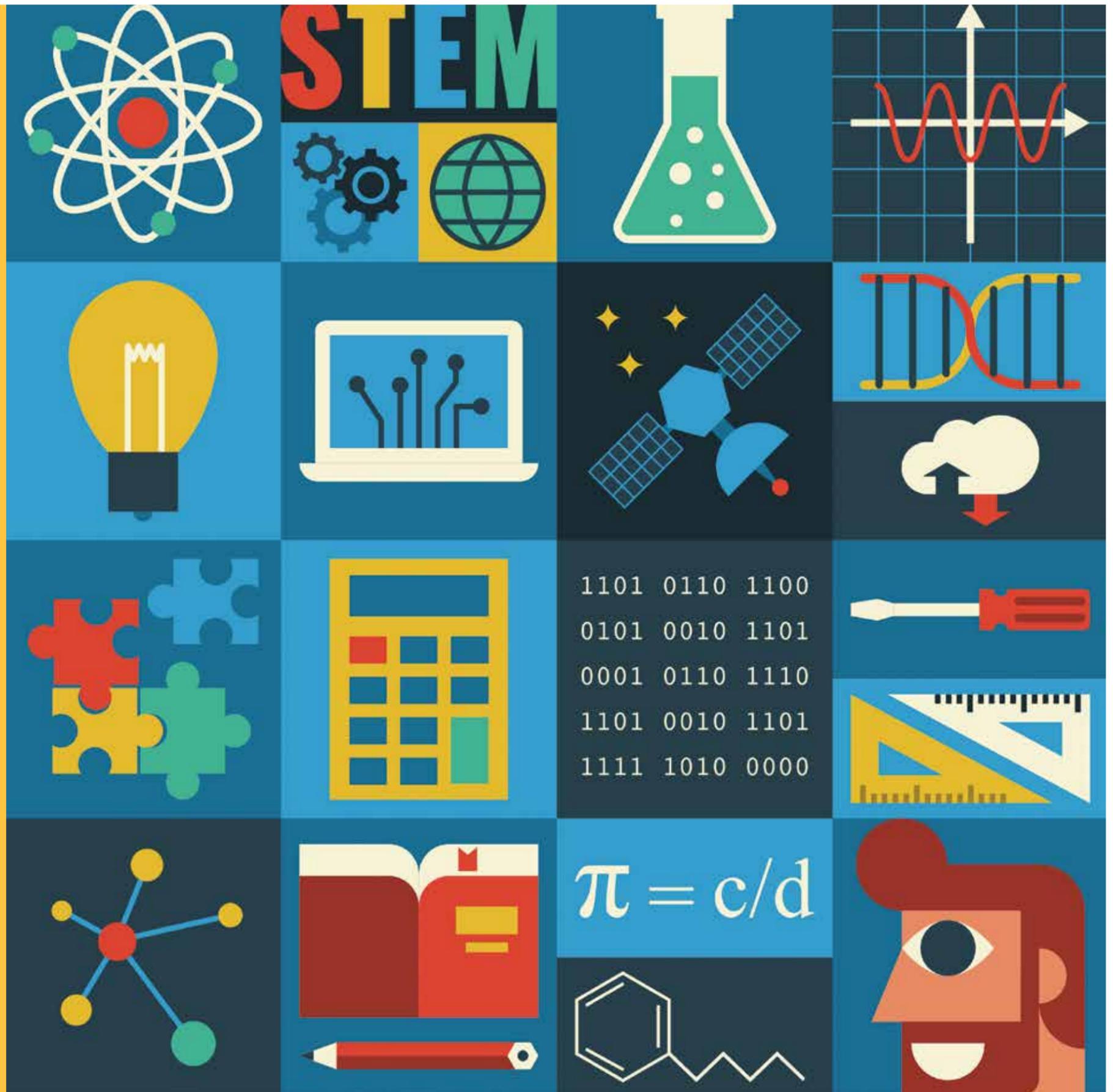
Why STEM?

Until the 1990s, students in the US were taught science, technology, engineering and mathematics independent of one another. But after years of research, the National Science Foundation concluded that these subjects should not and could not be taught independently, given that they co-exist in the

real world. Determined to equip the next generation with the skills to innovate, the Foundation married the four subjects under the acronym STEM. The STEM movement soon gained traction as the rest of the world recognised its competitive potential.

In countless ways, we experience the powerful amalgamation of science, technology, engineering and mathematics every single day. STEM is omnipresent in our lives. From the fuel that heats our homes, the smartphones and laptops we use, the apartments we live in, the airplanes we fly in, the cars that we drive, the roads and bridges we cross, the hospitals we receive treatment in, and the budgets we implement for our families, every aspect of our lives is touched by STEM innovation.

In this ever-developing world, our children need the skills to embrace and even create change. We don't really know the kind of world our children will live in 30 years from now, says Maly Pena, Marketing and Communications Manager at The International Montessori School (IMS). "The best way to support and help their development and happiness is to create children that are positive, resilient, adaptable, curious and even passionate about the new challenges that will happen around them – in fact, they should be the ones creating them. Maria Montessori, who was a scientist, said 'Imagination does not become great until human beings, given the courage and the strength, use it to create.'"





Bilingual Education

Expanding horizons in a multi-lingual atmosphere.

Bilingualism is the ability to use two languages to communicate, which has a significant, positive effect on cognitive ability as well as benefitting society as a whole. The local Hong Kong population has the great advantage of being in a trilingual society, with most individuals able to speak English, Cantonese and Mandarin, or at least two out of the three with high levels of competency. With this situation, however, toddlers can become late speakers, as some aspects vital to speech development are overlooked. It is important that toddlers are given an engaging and encouraging environment to learn in as speech development starts at an early age. When the correct concepts, motivation and opportunities are given to toddlers, speech will develop quickly and naturally.

Bilingual Education believes that language development is one of the most important aspects of early childhood education, and thus provides an innovative bilingual environment for children from ages 0 to 12 years. Their Mandarin-English programme focuses on helping children aged 0 to 6 years

become bilingual, while catering to different learning needs in language development, giving children a solid foundation at the earliest stage for further growth and development. Being multi-lingual opens doors and gives a broader scope of the world. In addition, Bilingual Education offers Phonics, Pinyin, Music x Therapy, and Art x Therapy Classes as part of their Speech Development strategy, providing a wider base for developing thinking skills and allowing children to think laterally and in different perspectives. It also fosters communication that is not limited to linguistic skill alone.

Their C+ programme for children aged 4-12 years aids in developing 12 C factors: Concentration, Creativity, Cooperation, Critical thinking,

Communication, Confidence, Competition, Compassion, Cognitive Development, Courage, Consistency, and Curiosity. This programme aims to expand their strengths, help them become aware of their weaknesses and provide the support to boost their skills. Children will be fully equipped with academic and life skills that will allow them to excel in their future endeavours. The Next Scientist Programme allows children to understand the world through scientific investigation and enhance skills in experimenting, summarising and reflecting, in addition to stimulating children's curiosity.

Being bilingual has been shown to be an advantage for neural development, social skills development and for success in later life. 🧠



Bilingual Education

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Enabling innovators

In late 2015, the Hong Kong Education Bureau (EDB) organised a Symposium to enhance the awareness of school principals and teachers of the importance of promoting STEM education. Earlier this year, it disbursed a one-off grant of \$100,000 for the promotion of STEM education to each government-aided and Direct Subsidy Scheme primary school, and in 2016/17, it will release updated Curriculum Guides for the Science Education, Technology Education and Mathematics Education Key Learning Areas to schools.

"The ultimate aim of promoting STEM in this territory is to nurture a range of talents with different capabilities and at different knowledge and skill levels to fulfil the economic, scientific and technological developments in our society and around the world, hence helping to maintain the international competitiveness of Hong Kong," says a spokesperson for the EDB.

The drive to educate schools on the importance of STEM education comes in part from the EDB's awareness

that, "while Hong Kong students perform well in science, technology and mathematics, they may focus on disciplinary studies and may not evenly participate in hands-on activities," according to Promotion of STEM Education – Unleashing Potential in Innovation, a document issued by the Curriculum Development Council in late 2015.

Implementing STEM

The challenge that Hong Kong schools face is that STEM represents a paradigm shift from a traditional education philosophy based on standardised test scores to a modern approach that values the learning process as much as the results. Schools now need to think beyond exam results and focus on creating a knowledge base for students that is applicable to real life.

"With STEM based learning, there is a journey of discovery. It is a way to offer real world skills to young minds trying to find their way. But Hong Kong's rote education format is strictly outcome based. The journey is discounted for the

net result," says Timothy Stuart.

His sentiments are echoed by Maly. She adds that the sole focus on results can deter children from wanting to learn and discover. Montessori classrooms are purposefully designed to offer a wide variety of interest-based activities that promote a child's love of learning and trust in their own ability to find the answers to their questions – a format that effectively fulfils the STEM philosophy.

"The way a Montessori child works means that she needs to get up, make a conscious decision to choose some material, use the material (therefore moving and focusing) and find her own answers; those answers then create more questions that will make her want to investigate further. The whole experience is rewarding and challenging in itself," she says.

An enjoyable education

Maly's concern is that when children are not participants in the learning process, there is no sense of pride or accomplishment when they complete





a task or learn something new. The process of STEM learning, however, is deeply enjoyable.

An engineer and mother of two, Sonal Darbari says her eight-year old daughter Tanisha, a student at Hong Kong International School (HKIS), enthusiastically attends after-school technology workshops and enjoys mathematics because she loves to solve problems. Last year, Sonal enrolled Tanisha in Scratch programming and Minecrafting summer classes while on holiday in New York. "As parents, we encourage her to do all of this stuff because she likes to do it. Making and creating things boosts her confidence levels and challenges her to do more difficult tasks," says Sonal.

Full STEAM ahead

Tanisha also has an artistic side. She likes to sketch and paint and enjoys the step-by-step process of creating origami. The arts are beneficial for helping individuals develop creativity, adaptability, innovation, communication and social skills, says Lakisha James, a STEAM specialist at American School Hong Kong. When the arts are

connected to STEM, student learning and understanding deepens. While some educators believe that STEM naturally involves the arts, Lakisha says STEM and STEAM philosophies are similar but not the same.

"Unlike STEM, STEAM intentionally exposes students to the arts to help them develop creativity and critical thinking skills. At school, for example, third grade students learn about balanced and unbalanced forces. Small groups work collaboratively to engineer marshmallow launchers. They identify the balanced and unbalanced forces on their prototype, measure the distance travelled by the marshmallow and make adjustments throughout the process. Then, each group creates a poster and films a commercial to advertise their product. This lesson combines all five STEAM subjects and has application in the real world."

Researchers concur that girls and boys learn differently. The focus on teamwork, art and collaboration may attract more girls to STEAM learning, thus serving to reduce the current gender gap at higher education level and in the workforce.

The future

Be it STEM or STEAM, the purpose of these new philosophies is to equip children with the tools to succeed in our rapidly changing world. Gone are the days when children would be expected to sit still, stare at a board, listen to lectures and memorise core subjects. Not only will the journey of discovery empower and excite innovators, it will have a positive bearing on every aspect of our children's lives, irrespective of their career choices or their chosen field of expertise.

"STEM and STEAM are a part of our daily lives now. Having a good and broad understanding of these subjects will be a real advantage in future job markets but there's so much more," says Tony Bryant, founder of Bryant English – a Tuen Mun-based English tutorial centre that incorporates technology into English lessons and hosts a series of 'Kids Can Code' classes. "Coding, for example, is a creative process – learners develop skills such as lateral thinking, collaboration, patience and problem solving. These are skills that are useful in all areas of life." 

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