



# 研究背景

隨着環球合作的趨勢，培養學生具備廿一世紀的技能是教育的一大重心。2015年，香港緊隨其他發達國家推行STEM教育，增加對創新科技產業的投入。然而，STEM仍停留在校本試行階段，縱使政府在資金和設備上提供支援，學校在落實STEM教育的經驗和具體方法上，還面對不少挑戰。

我們認為香港STEM教育有必要制定完整的架構，由特區政府統籌頂層設計(top-level design of STEM education) 核心素養、調配資源、教師培訓，並逐漸改善制度，為學生的STEM發展提供更多升學及就業空間。



# 政策建議

## (一) 創建「STEM+促進中心」

政府設立「STEM+促進中心」，負責民間機構未能參與的部份，包括教師培訓、協調院校與商界合作等，使其在學校發揮正面作用。以「STEM+」為題，不單只進行課程促進，亦連結學校校本培訓、院校教師培訓、商界支持、外地經驗交流等。

## (二) STEM+分階段的教學策略

我們建議教育界應鼓勵小學及初中學生參與，在未有公開考試壓力之前，提升他們的學習興趣。在不同的學習階段，學校應配合不同教學策略，以配合學生在本地課程的水平。幼兒及初小階段應着重以活動和遊戲形式學習STEM，讓學生在幼兒及小學階段對STEM有初步理解和認知，增加對STEM的接納程度和興趣。高小至初中階段以專題研習、報告形式加入課程單元。學生在研習的過程中運用課程知識，同時發展學生在溝通、創意及解難上的能力，培養科學素養。高中階段應針對學生的務實思維，因此STEM在高中階段可以考慮配合商界作生涯規劃，讓家長及學生

瞭解到STEM的出路及就業的機遇，以及知識型經濟改革帶來的挑戰。

## (三) 訂立STEM+素養框架

我們倡議香港的STEM+教育應具備五種素養，包括(a)科學及科技素養，即是指知識內容，例如科學原理、科技知識，同時也要發展學生的實行能力，包括科學式詰問，清晰定義問題，設計並執行課題研究，分析並解讀數據，使用工具，進行學術論證，及分享發現並給出評論；(b)綜合運用與創新素養，學生應能夠將STEM範疇的知識互通作跨學科綜合能力的運用；(c)解難能力素養，例如如何將難題分拆，辨認難題與科學知識的關連等，以提升學生的競爭力，以免被社會發展淘汰；(d)群體協作素養，讓學生在群體協同中相互幫助、相互啟發，進行群體知識建構；(e)社會關懷，透過觀察、解難及創新等過程，以科技推動人類社會進步，克服社會挑戰，讓科技正面地建設社會。

## (四) 創建STEM+商校大平台

(1)在大型的博覽會、比賽加入企業參與，讓中學生的作品和發明有機會成為產品，延續創意；(2)為中學生提供獎學金在海外或本地升學、進行相關科研工作，以改變家長和中學生對相關行業的既有印象；

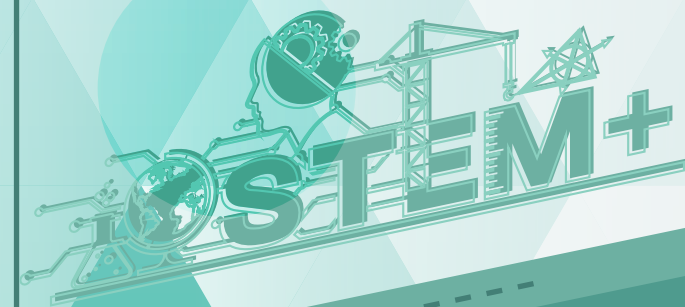
(3)為有優異研究成果或潛能的中學生提供實習及僱用承諾，為他們提供穩定的出路。

## (五) 改善大學收生制度，推薦尖子升讀相關課程

我們認為政府應為有意向創科發展的優秀學生提供適合的晉升途徑，建議為優秀而有意升讀大學科學、工程及其他相關課程的學生提供資助，讓大學可以通過非大學聯合招生辦法(Non-JUPAS)取錄。

## (六) 提防本末倒置及過分迎合現今科技

STEM+教育是為未來經濟提供人才。由學生於學校內接觸STEM+教育到其畢業，相距可以超過十年。科技日新月異，今日在校內所應用的技術必然成為畢業時的歷史。課程及課時不應該過份側重現今科技的運用，而應是提升學生的學習興趣以及STEM+核心素養，以免捨本逐末。



# STEM+

Globalization & Top-level Design of STEM Education

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## Research Background

Globalization and the rapid advances in science and technology require students to acquire abilities to adapt to the 21st century. The HKSAR Government launched in 2015 STEM education (science, technology, engineering and mathematics), besides expanding investment in the innovation and technology industries. While the government has provided support on funding and equipment for STEM education, schools face various challenges during its implementation.

We are of the opinion that there is the need for a holistic framework to develop STEM education in Hong Kong, covering top-level design, resource allocation, teacher training, local university admission system, and career education.



## Policy Recommendations

### (1) Establish a “STEM+ Promotion Centre”

It is suggested that the Education Bureau should establish a “STEM+ Promotion Centre” to take up responsibilities in areas such as teacher training and coordinating resources of both the education and business sectors, so that resources can be utilized to generate positive impact in schools. As the title “STEM+” suggests, the centre to be set up is for the purposes of facilitating curriculum development, supporting school-based training and institutional teaching staff training, connecting with the business sector, and supplying experience exchange opportunities with other cities.

### (2) Different teaching strategies by stages

We suggest that the education sector should encourage primary and junior secondary students to participate in STEM education before they face, in senior secondary years, pressure from public examinations.

**STEM+ Play** should be adopted at kindergarten and junior primary levels, to enable them to have elementary ideas and understanding about STEM, thereby increasing their acceptance level and interest towards STEM.

**STEM+ Inquiry-based learning** should be applied, at senior primary and junior secondary levels, which would include projects and presentations in the curriculum. Students have to utilize knowledge which they learn in lessons and study projects. Their abilities in communication, creativity and problem-solving can simultaneously be developed. This would cultivate students’ scientific literacy.

**STEM + Career & Life Education** is to be adopted at senior secondary level to accommodate to the pragmatic thinking of students and their parents. This may include collaboration with the business sector for life planning purpose, allowing parents and students to discover the career paths and opportunities of STEM, as well as the challenges brought by progress in the knowledge-based economy.

### (3) Establish STEM+ literacy framework

We advocate the following framework of Hong Kong's STEM + education :

**(a) Academic literacy** -- This refers to the acquisition of knowledge content, e.g., scientific principles, but at the same time developing students’ values and abilities in execution. This includes scientific interrogation, clearly defining the question, designing and executing a research topic, analyzing and explaining data, using tools, making academic arguments, sharing discovery and making value-judgments.

**(b) Integrated literacy and innovation skills** -- Students can make use of all their STEM-related knowledge and integrate their knowledge with their experiences to connect cross-cutting concepts and complete cross-discipline real-life application.

**(c) Problem-solving skills** -- For example, the ability to identify and break down difficult questions, and to connect difficult problems to related science concepts. STEM education thus should not lean too much towards students’ knowledge acquisition, but should also train students’ problem-solving skills, so as to raise students’ competitiveness.

**(d) Collaborative literacy** -- STEM education should provide opportunities for collaboration so that students can help and inspire each other in group learning.

**(e) Social care** -- The application of STEM and innovation is based on students’ care for the society. Through observation, problem-solving and innovation, students can promote social progress and tackle social challenges with technology, thereby making a better world.



## 推動STEM+ 教育

STEM教育的在地化與頂層設計

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