

Dedicated Funding Programme for Publicly-funded Schools

Project Number: 2021/1259 (Revised)
Name of School: 基督教女青年會丘佐榮中學
The Y.W.C.A. Hioe Tjo Yoeng College
Project Title: 校本 STEM 課程
School-based STEM Programme
Beneficiaries: Secondary
Estimated Number of Direct Beneficiaries: Student:360 (S1-S3)
Teacher:15

1. Project Needs

1.1 Project aim(s)

The project aims at developing school-based junior secondary STEM education, nurturing generic skills, arousing students' interest in STEM-related subjects, equipping them with a solid background to apply STEM knowledge and skills to solve real life problems creatively and collaboratively. Moreover, the project will enhance teachers' professional capacity in implementing STEM education through the teachers' development programmes.

1.2 School-based innovative element(s)

The project consists of school-based innovative elements. Our school has been promoting STEM education since 2016 by organizing different learning activities for all students, and nurture students who are interested / have good performance in STEM learning activities to participate in various competitions. Students were willing to engage in new challenges and competitions. Moreover, they were eager to explore new technologies, such as machine learning and simulation models. Their collaboration team spirit and presentation skills were enhanced since they had to reply and respond to judges' questions in various competitions. Their fulfilment has driven them to strive for excellence. To have a holistic approach, our school plans to further incorporate STEM education into daily learning and teaching. Students will be provided with opportunities for learning relevant knowledge and skills, such as mobile and robotic programming, AI, VR/AR production and 3D design and printing, mobile app development. Moreover, students will be allowed to gain more hands-on learning experience with relevant equipment. Thus, they will have more opportunities to apply what they have learnt and their learning experiences will be enriched.

1.3 Meeting with school-based/students' needs

Item: Relevance to the school development plan of this cycle/major concern

One of the foci of the school's three-year development plan (2021-2024) is to foster students to be positive towards learning and life. Study skills via strengthening learning by explorations and investigations, e-learning and self-directed learning as well as to enhance teachers' professional capacity in implementing STEM education through teachers' development programmes.

2. Project Feasibility

2.1 Key concept (s)/rationale(s) of the project

Item: Reference the Education Bureau curriculum documents/guidelines

The rationale of this project comes from the suggestions stated in the "Report on Promotion of STEM Education - Unleashing Potential in Innovation" (December 2016) released by the Education Bureau. The main points include:

- Renewing the curricula of the Science, Technology and Mathematics Education Key Learning Areas (KLAs)
- Enriching learning activities for students
- Enhancing professional development for schools and teachers

We will review and modify the school-based junior secondary ICT, D&T and Science Education curricula. Learning activities, such as robotics, 3D printing, artificial intelligence, problem solving tasks will be organized for different grades of junior secondary level, with a view to enriching their learning experiences. The S3 students will be encouraged to apply the knowledge and skills they have learnt to solve some real-life problems followed by a showcase for local community.

Our school also plans to organize some training activities for teachers to enhance their professional capacity in designing and implementing STEM learning activities, hence enhancing the learning and teaching effectiveness.

2.2 School's readiness

Item: Relevant school experience

STEM unit has been established in the school. STEM related teachers are trained with related workshops and trainings. Student abilities in coding skills are well developed with the Enhanced IT Programme (EITC) which is funded by Office of the Government Chief Information Officer. Students have demonstrated their abilities in competitions with various awards granted. The existing facilities catered for the STEM curriculum are mainly the ICT lab and D&T room. The computation knowledge was established and enhanced with the latest facilities in the ICT lab. However, students' proposed solution realization process and prototyping process were limited by the traditional tools, facilities, and types of equipment that were located in the old D&T room on the ground floor which has been used for more than 35 years and has never been upgraded. In addition, from the previous experiences of students participating in various external competitions and activities, we found that prototyping was a very important process in realizing ideas. Students were able to visualize problems and solve them by themselves through the DIY prototyping process. Therefore, the school realized that by having a working space with the latest tools and equipment students can benefit more. Due to the limited spaces, the school intended to renovate the existing D&T room into an integrated D&T & Innovation STEM room.

Item: Student Awards List

(Year 2020/21)

1. Hong Kong Secondary School IT Knowledge Competition 2021:最多優秀學生獎(亞軍)
2. URC 2021 發明比賽:(初中組)最佳發明大獎,(高中組)最佳演講大獎,(高中組)最受歡迎大獎
3. Code2App Challenge 2021:2nd Runner-up, AI Application Award
4. 2021 人工智能及機器人應用夏令營:學校大獎銅獎
5. CityU Summer Camp Internet of Things (IoT) Stem Education -Workshop:1st Runner Up

(Year 2019/20)

1. AiTLE & William Jessup University (WJU) 1 Million HKD Scholarship Computer Science Competition: Champion
2. The Greater Bay Area STEM Excellence Award 2020:十佳學校

(Year 2018/19)

1. MakeX Robotics Competition 2018 World Championship: Second Prize Award (Junior High School Group)
2. 2018 第十三屆「創協盃」創意科技機械人比賽: First Prize Award - Secondary Group, Second Prize Award - Secondary Group
3. JSIT FormulaR 2019 機械人方程式賽車錦標賽: First Prize Award
4. 2019 RoboSTEM - 香港區公開賽: Champion (Open Section - Senior Group)
5. YITAA 獎勵計劃 x Microsoft Technology Associate (MTA) 認證: 學校最佳成績第三名
6. Canadian Computing Competition (CCC) 2019 - Hong Kong Contest: (Junior Division) Certificate of Merit, Honorable Mention
7. HK Primary and Secondary Schools STEM Robotics Competition 2019: Champion
8. Computer App Programming (CAP2019) Competition: 1st runner-up

(Year 2017/18)

1. Inter-School IT Elite Challenge 2018: Champion
2. Computer App Programming 2018 Competition: Senior: Champion; Junior:1st runner-up
3. FIRST Tech Challenge: Winning Alliance Award (HK Tournament), First Prize (Shenzhen Tournament)
4. Minecraft Arena: Second Runner-Up
5. MakeBlock AI 發明設計大賽: Third Runner-Up
6. Computer Science Challenge 2018: Third Runner-Up
7. Cisco Innovation Challenge 2017-18: Creative Award
8. AiTLE InnoSTEMer MakeX Robotics Competition 2018: Champion, Gold Award, Best Design Award

Student Awards List (Year 2016/17)

1. Computer Science Challenge 2017: Champion

2. Minecraft Arena: Second Runner-up
3. 全港 mBot 機械人挑戰賽 2016: 三等獎
4. 機械人大決戰 2017 : Best Performance Award

(Year 2015/16)

1. Inter-School IT Elite Challenge 2016 (「校際 IT 精英挑戰賽 2016」): 1st Runner-up Award
2. STEM in mBot 2016: 1st Runner-up Award
3. Computer App Programming 2016 Section: Project (Junior Form) Competition: Winner
4. Computer App Programming 2016 Section: Problem solving (Junior Form) Competition: 2nd Runner-up Award

2.3 Principal and teachers' involvement

School Staff: Principal

Duties: Formulate plans, Monitor and supervise, Coordinate / collaborate, Plan curriculum / activities, Process funding

School Staff: Vice principal

Duties: Formulate plans, Monitor and supervise, Coordinate / collaborate, Plan curriculum / activities, Process funding

School Staff: Curriculum leader

Duties: Formulate plans, Monitor and supervise, Coordinate / collaborate, Plan curriculum / activities, Process funding, Conduct / participate in activities, Consolidate learning and teaching materials

School Staff: Subject panel head

Duties: Formulate plans, Monitor and supervise, Coordinate / collaborate, Plan curriculum / activities, Process funding, Conduct / participate in activities, Consolidate learning and teaching materials

School Staff: Project leader

Duties: Formulate plans, Monitor and supervise, Coordinate / collaborate, Plan curriculum / activities, Process funding, Conduct / participate in activities, Consolidate learning and teaching materials

School Staff: Subject teachers

Duties: Coordinate / collaborate, Plan curriculum / activities, Process funding, Conduct / participate in activities, Consolidate learning and teaching materials

2.4 Project period

Project Start Date and End Date: from 03/2024 to 06/2025

The project lasts for 16 months.

2.5 Details of project activities

a. Project implementation measures

Implementation Period:

03/2024 – 06/2025

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
<p>Activity 1</p> <p>Smart Photo Clip Design</p>	<p>Target Group: S1 students (Around 30 students in a class)</p> <p>Implementation strategies: A smart photo clip will be designed and created during the activity.</p> <p>Lesson 1: A brainstorming exercise will be conducted through an app so students will think of what photo clip will be. Hence, another app will be used as a mind map for collecting the features of smart photo clips. Students use 'isometric paper' to generate and present ideas and give the possible solutions.</p> <p>Lesson 2: Students will use photo editing software to edit their photos to be clipped into the smart photo clip. The techniques will be delivered so students can have their tailored picture.</p> <p>Lessons 3 – 5: Students will learn a microcontroller and understand how to use the microcontroller and LED to create a smart photo clip. The auto-lighting idea will be delivered so students understand the LED lights up when it is dark while LED will not turn on when it is bright. Other smart features will be added into the smart photo clip in order to enhance students' creativity. The students have to understand the circuit in order to connect the LED to the microcontroller. Wiring will be involved.</p> <p>Lessons 6 – 7: Students need to use simple hand tools and special glue to make the selected final photo clip with the connection of wires and microcontroller. The presentation of their final product will be done afterwards.</p> <p>Key Learning Areas/ Subjects/ Learning elements: Lesson 1: Technology – K6 Production Process: understand the factors in selecting various process for designing and making products.</p>	<p><u>STEM and IT lessons</u> 7 double lessons per class, 4 classes (80 minutes each)</p> <p>(Total: 9 hours 20 minutes)</p> <p>All the lessons will be delivered in STEM and IT lessons</p>	<p>STEM and IT Teachers</p>	<p>Students should be able to present their ideas in a mind map. They can be able to present 3-D figures into 2-D ways.</p> <p>Students understand the use of microcontroller and some sensors. Also, students understand how to use the embedded light sensor in microcontroller to design auto-lighting system.</p> <p>Besides, they should be able to use simple hand tools to make photo clips.</p>

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
	<p>Mathematics – (17) Sketch the 2-D representations of 3D figures: sketch their own photo clip design using 2-D representations.</p> <p>Lesson 2: Technology – K16 Information processing and presentation: using online graphic editing software to design their own picture.</p> <p>Lessons 3 – 5: Technology – E6 System integration – Introduction to micro-controller-based system K2: Programming concepts K16: Information processing and presentation: Understand the concept of "input → process → output". Besides, students will understand the importance of the stored program in an automated processing task and using programs to control a microcontroller. Sensors will be used so the system integration will be implemented.</p> <p>Science – 8.1 Simple circuit about closed circuit, switch: the concepts of closed-circuit using a microcontroller will be taught and signal from the microcontroller to computer will be told.</p> <p>Lessons 6 – 7: Technology – K5 Tools and Equipment: students use different measuring tools, cutting tools, holding tools to make the photo clip.</p>			
<p>Activity 2</p> <p>Using 3D Animation Platform to Stimulate Science Concepts, such as Animal Cells and Space</p>	<p>Target Group: S1 students (Around 30 students in a class)</p> <p>Implementation strategies: Students will be able to use 3D modelling online platform to create a 3D figure of animal cell and some models will be printed using 3D printers for demonstration. Students will also complete the simulation of the cell structure using an animation platform by sharing their 3D models of internal parts of an animal cell.</p> <p><u>Science</u> Lesson 1: Students learn about basic structures of plant cells and animal cells. They can identify the basic structures of cells, including cell membrane,</p>	<p><u>Science Lesson</u> 1 double lesson per class, 4 classes (80 minutes)</p> <p><u>STEM and IT lessons</u> 4 double lessons per class, 4 classes (320 minutes)</p> <p>(Total: 6 hours and 40 minutes)</p>	<p>Science teachers + STEM and IT teachers</p>	<p>Students should be able to present their knowledge of the structures of an animal cell in 3D animated format through an animation platform. Their animation will be presented on LCD panels.</p> <p>Also, students are able to design and model their 3D</p>

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
	<p>cytoplasm, nucleus, vacuole. They are able to state the functions of the basic structures of cells.</p> <p><u>STEM and IT</u></p> <p>Lesson 1: Students will get started to use an animation platform to create their first 3D animation. A task will be set in order that students understand how to create the environment, insert objects, upload videos and code for objects' actions.</p> <p>Lesson 2: Students will use an online 3D modelling platform to create 3D figure of an animal cell. Students should remember what they have learnt during Science lessons about animal cells.</p> <p>Lesson 3: Students are able to insert the object file of an animal cell created with an animation platform. Students are able to add some annotations into the models for simulation.</p> <p>Lesson 4: Students will be able to use an animation platform in more advanced functions. To inspire students about the development of space, two scenes will be made for the animation to simulate the rocket to fly to solar system.</p> <p>Key Learning Areas/ Subjects/ Learning elements: Science – Lesson 1: Science – 4.1 Cells – the basic units of living things: students will understand the basic structure of animal cells and plant cells. They can distinguish them.</p> <p>STEM and IT – Lesson 1: Technology – K16 Information Processing and Presentation: multimedia element – animation is delivered so that students understand more about the production of 3D animation.</p> <p>Lesson 2: Technology – K6 Production Process: Presentation of design ideas in 2D and 3D using projection views. 3D models of animal cell will be printed using 3D printers.</p> <p>Mathematics – 17.4 3-D figures – recognize the three orthographic views of 3-D figures: Students will use top, side and front views to control the use of platform to design 3D figures.</p>			<p>figures using 3D modelling platform and understand how to print their models using 3D printers.</p> <p>Students understand how to produce 3D animation and feel interested in space flight when designing related 3D animation.</p>

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
	<p>Lessons 3 – 4: Technology – K6 Production Process: Animating of design ideas in computer animation will be given during lessons.</p> <p>Science – 11.6 Space flight: understand the rockets to escape from gravity when launched to outer space when designing the animation. The solar system is introduced.</p>			
<p>Activity 3</p> <p>Mini Smart Device – Smart Bin</p>	<p>Target Group: S1 students (Around 30 students in a class)</p> <p>Implementation strategies: Students will further use a microcontroller with different sensors to have a product design – Smart Bin. The product consists of servo motor, motion sensor and plastics/ wood. Students are able to create a 3D hollow figure. Afterwards, it will embed the sensors and a microcontroller with the connection between them and coding.</p> <p>Lesson 1: Students will learn more about a microcontroller and its extension board with different sensors with different tasks and situations such as using motion sensor and LED for alarm system.</p> <p>Lessons 2 – 3: Students start designing their smart bin with the shapes that they want, such as regular prisms or right prisms. They must understand the measurement error will affect the volume to be formed. During this moment, students may use tools to stick the plastics/ wood together to form volume. Also, they need to reserve places for motion sensor and servo motor to be embedded.</p> <p>Lesson 4: Students will use a microcontroller with motion sensor and servo motor. They connect them with the aid of wiring technique. Afterwards, coding into a microcontroller. Testing and debugging will be carried on.</p> <p>Key Learning Areas/ Subjects/ Learning elements: Lessons 1 and 4: Science – 8.3 Series circuit & parallel circuit: students should understand that the parallel circuit is used to connect two sensors into the same device.</p> <p>Technology – K8 Systems and Control: electronic control system (Smart Bin) is set up and students should understand the theory behind.</p>	<p><u>STEM and IT lessons</u> 4 double lessons per class, 4 classes (80 minutes each) (Total: 5 hours 20 minutes)</p>	<p>STEM and IT teachers</p>	<p>Students understand and use different inputs and sensors on microcontroller and program it using blockly programming language.</p> <p>Students understand the concepts of different shapes of volume and they recognise the importance of accurate measurement when making their smart bin.</p>

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
	<p>K2 Programming Concepts: students should state the inputs and outputs when designing the smart bin. Also, students can input corresponding program into a microcontroller.</p> <p>Lessons 2 – 3: Technology – K5 Tools and Equipment: basic hand tools such as cutter, handy power hand drill and screwdriver are used to process materials. K6 Production Process: students think of the design.</p> <p>Mathematics – 15.1 Errors in measurement: students should aware of the errors leading to the problem of assembling. 17.1 3-D figures: students recognize the concepts of right prisms, right circular cylinders, right pyramids, regular prisms and so on for their own shape of Smart Bin.</p>			
<p>Activity 4</p> <p>Engineering Design Thinking Task: Tea Brewer Challenge: Microcontroller-Based Prototyping</p>	<p>Target Group: S2 students (Around 30 students in a class)</p> <p>Implementation strategies: STEM is not only delivering hand-on tasks to students, but it is also important to let students understand the idea of engineering design thinking and to be tech entrepreneur in the future. First of all, defining the problems via drinking tea in Chinese culture will be done. After defining problem, students start researching about the features of smart tea brewer. Then, they start working on tea brewer with the use of servo motor, temperature sensor, motor with fan and so on to carry on their prototyping.</p> <p>Lesson 1: Students understand the background of the health issues when drinking tea with over steeping or temperature higher than 60°C. Afterwards, students should understand the features of tea brewers. Then, they start using servo motor to simulate the steeping action of tea brewer. They must use tools to help screw and install popsicle in servo motor.</p> <p>Lesson 2: Students start to make a smart fan by understanding how to auto control the switch of the fan with different temperatures. They should also understand the ideas of digital and analog signals when controlling the motor using a microcontroller. Secondly, students investigate how to cool down hot water with different speeds of fan. They use spreadsheets to collect the data read from a microcontroller and try to create line chart to understand the relationship between speeds of fan</p>	<p><u>STEM and IT lessons</u> 5 double lessons per class, 4 classes (400 minutes)</p> <p>(Total: 6 hours and 40 minutes)</p>	<p>STEM and IT teachers</p>	<p>Students understand how to follow through the step of a project with the scientific situation.</p> <p>Students are able to use microcontroller to complete some tasks about smart ideas.</p> <p>They understand the importance of engineering design thinking in order to design their own prototype.</p> <p>By using spreadsheets, they understand how to collect the data and present the data with the correct use of charts.</p>

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
	<p>and temperature change. In this part, students should also think if it is good to cool down tea as quick as possible while steeping the tea bag.</p> <p>Lesson 3: Students use light sensor to determine the concentration of tea. Students try to figure out the relationships between the concentration of tea and its colour intensity and also the relationship between the concentration of tea and the light intensity passing through the tea sample. Afterall, students use trend line in the data collected to figure which colour intensity will provide different tastes of tea. In this part, students also investigate about the acidity of tea by using pH sensor connected with a microcontroller. Students can figure out what acidity provides the best taste of tea.</p> <p>Lessons 4 – 5: After collecting all pieces of information, students start designing their smart tea brewer. They use different sensors and features to make their own prototypes. Also, they use tools to help them assemble the tea brewer. Meanwhile, they have to test and debug before presentation.</p> <p>Key Learning Areas/ Subjects/ Learning elements: Lesson 1: Science – Through the health issues when drinking tea, students understand that the tea include tannic acid and it increases the chance to causes cancer when drinking tea that is over 60°C.</p> <p>Technology – K8 Systems and Control: students make use of servo motor and popsicle to create a simple tea brewer of tea bag. K2 Programming Concepts: students code into a microcontroller and start understanding different algorithms for it.</p> <p>Lesson 2: Science – 5.3 Energy sources – saving energy: students should understand to save energy with the use of auto smart fan.</p> <p>Technology – K2 Programming Concepts: students code into a microcontroller and create smart fan system. K16 Information Processing and Presentation: students use spreadsheets to group the data and create charts in a collaborate file together for more analysis.</p>			

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
	<p>Mathematics – 28 – 30 Data Handling Strand: Students should organize the data collected and interpret statistical chart and analyze it.</p> <p>Lesson 3: Science – 9.1 Common acids and alkalis & 9.2 Measuring pH for acids and alkalis: students can use pH sensor to record the pH scale of the tea and understand the best taste of tea.</p> <p>Mathematics – 28 – 30 Data Handling Strand: students collect the data of light sensors with different concentration of the tea.</p> <p>Technology – K16 Information Processing and Presentation: students use spreadsheets to create chart for further understanding of the use of data.</p> <p>Lessons 4 – 5: Science – 5.2 Heat transfer: students understand the heat transfer process and make a container that can keep temperature in a constant temperature they want.</p> <p>Technology – K6 Production Process: students think of the design. K5 Tools and Equipment: students use different hand tools to make their own prototype of smart tea brewer. K2 Programming Concepts: students code into a microcontroller.</p> <p>Generic Skills [Major focus] Presentation skill – students present their prototype. Collaboration skill – student collaborate with team mate to create a smart tea brewer. Creativity – they create their own tea brewers with different elements into them.</p>			
<p>Activity 5 Smart Car Design</p>	<p>Target Group: S2 students (Around 30 students in a class)</p> <p>Implementation strategies: In this task, students design and make a smart toy car which can move up an inclined plane with the time set. Some challenges such as transporting ping pong will be set to complete. Through this task, students should understand how to design their smart toy car with the appropriate materials, the correct use of data to formulate the speed of toy car in a microcontroller</p>	<p><u>Science lesson</u> 6 double lessons per class, 4 classes (480 minutes each)</p> <p><u>STEM and IT lessons</u> 6 double lessons per class, 4 classes</p>	<p>Science teachers + STEM and IT teachers</p>	<p>Students understand the concepts of force and motion in Science lessons.</p> <p>Students are able to use tools to create their smart toy car with the aid of 3D printer and laser cutter.</p>

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
	<p>to walk up an inclined plane, the science concepts about force, friction and so on.</p> <p><u>Science</u> Lesson 1: students recognize the relationship between average speed, distance and time. They represent a motion using a distance-time graph. They also understand uniform motion and non-uniform motion.</p> <p>Lessons 2 – 3: Students should describe the effect of force on changing the speed and direction of motion of an object. They know how to measure forces including contact forces and non-contact forces. They recognize that an object will stay at rest or in uniform motion when the forces acting on it are balanced.</p> <p>Lesson 4: Students are able to state the gravity is the force causes two objects to attract each other. They recognize the force of gravity experienced by an object increases with its mass.</p> <p>Lessons 5 – 6: Students recognize that friction and air resistance are forces that oppose the motion between contact surfaces. They can give examples of situations where friction or air resistance are useful.</p> <p><u>STEM and IT</u> Lessons 1 – 2: Students should understand the mechanical engineering and the everyday uses of simple machines and wheels and axles. First, the lesson will introduce simple machines about level, inclined plane, pulley and screw. Afterwards, students start assemble the basic tools to make a toy car. Besides, students start thinking to connect the motors with a microcontroller for the car. In their design, they should think how to put a microcontroller onto it with the connection of motors. Students also understand to use 3D printers and laser cutter to print some parts for his smart toy car.</p> <p>Lesson 3: Students explore the relationship between speed and slope by enabling a microcontroller on smart car to measure the angle of the slope. Also, students understand how to enable the smart car to automatically adjust its speed according to different slopes so it can always finish travelling up the slope around the same time. Students should deduce the relationship between different angles by using angles related with rectilinear figures. By setting up different slopes of the plane, student can formulate</p>	<p>(480 minutes) (Total: 16 hours)</p>		<p>Students can move the smart toy car up in an inclined plane by formulating Mathematical equation into microcontroller.</p> <p>Students understand the concept of centre of gravity and figure out how it affects the toy car when going up different angles of inclined planes.</p> <p>Students use different generic skills to complete some challenging tasks such as transporting ping pong during the lessons.</p>

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
	<p>the equation of straight line by trend line of spreadsheets.</p> <p>Lesson 4: Students learn the concepts about weight, centre of gravity and torque, and complete the tasks by designing an accessory to shift the centre of gravity of the smart toy car in order to enable it to travel steadily up a steep slope.</p> <p>Lessons 5 – 6: According to the challenging tasks, students figure out how to solve the problems with their team mates. During the process, they test and debug in order to improve their smart toy car.</p> <p>Key Learning Areas/ Subjects/ Learning elements: Science – Lesson 1: Science – 11 Force and Motion (11.1 Motion, 11.2 Force, 11.3 Gravity and 11.4 Friction and air resistance)</p> <p>STEM and IT – Lessons 1 – 2: Technology – K3 Materials and Resources: Students use wood or plastic to make the smart toy car. K4 Structures and Mechanisms: students understand the general concepts of input energy, controlled motion, friction and output work done in smart toy car. The idea about control motion such as screw mechanisms, lever and linkage should be delivered. K5 Tools and Equipment: Students should select different tools and machines to help him create the smart toy car such as 3D printer and laser cutter. K6 Production Process: Students should know the process of product design.</p> <p>Lessons 3: Mathematics – 19 Angles and parallel lines: students should understand how to find the angle between tilting a microcontroller and horizontal line with the use of parallel relationship for the angle between inclined plane and the horizontal plane. 28 – 30 Data Handling Strand: Students should organize the data collected from different speeds of motor with different angles of inclined plane and interpret statistical chart and analyze it. 8.2 Formulate linear equations in one unknown from a problem situation: students understand the equation form from the trend line drawn from spreadsheets.</p> <p>Technology – K16 Information Processing and Presentation: students use spreadsheets to group the data and</p>			

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
	<p>create charts. Then use the trend line to form an equation.</p> <p>K2 Programming Concepts: students code into a microcontroller for the formula set and drive the smart toy car to move.</p> <p>Lesson 4: Science – Centre of gravity and torque will be taught and students understand more why the toy car will fall down when increasing the slope of inclined plane.</p> <p>Lessons 5 – 6: Generic Skills [Major focus] Collaboration skill – students collaborate with team mate to complete the tasks. Problem-solving skill – students should understand the challenge tasks and find ways to solve them. Communication skill – students should communicate to come up with solutions to reach a consensus.</p>			
<p>Activity 6</p> <p>Tasks about Artificial Intelligence</p>	<p>Target Group: S1 and S2 students (Around 30 students in a class)</p> <p>Implementation strategies: Learning by doing is the most common strategy in STEM. By understanding the ideas of Artificial Intelligence (AI), students are able to complete tasks with different platforms. During the tasks, students will be able to understand how machine learning similar to human learning and how to use machine learning models to train the system.</p> <p><u>Secondary 1</u> Lessons 1 – 3: Students understand about what AI is. They start using a blockly coding online platform to experience about age recognition and gender recognition. Secondly, students will code the voice controlled light bulb. By using the microphone, students can use voice to control the light bulb in the scene to turn on or off. By understanding the machine learning, students start making a game of rock-paper-scissors. Students train the models to recognize their poses of rock, paper and scissors and code the programs for the game. Students can play the game with computer using web camera.</p> <p><u>Secondary 2</u> Lessons 1 – 2: Students will use [REDACTED] platform to understand the idea of AI. Through image classification, students use the extension created by</p>	<p><u>STEM and IT lessons</u> Secondary 1: 3 single lessons per class, 4 classes (40 minutes each) (Total: 2 hours) Secondary 2: 2 double lessons (80 minutes each) (Total: 2 hours 40 minutes)</p>	STEM and IT teachers	Students understand the concepts of machine learning and voice recognition in AI. They understand more uses of AI.

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
	<p>██████████ and code to see if the objects can be classified using the camera from smart phone.</p> <p>Lessons 3 – 4: Through machine training, students train the models with their faces and hidden faces so they can make a mobile application to test whether the system can recognize them correctly.</p> <p>Key Learning Areas/ Subjects/ Learning elements: Mathematics – 28 – 30 Data Handling Strand: Students should organize the data collected to let AI carry on the analysis.</p> <p>Technology – K2 Programming Concepts: students need to program when designing online games or mobile applications.</p>			
<p>Activity 7</p> <p>STEM Project-based Learning</p>	<p>Target Group: S3 students (Around 30 students in a class)</p> <p>Implementation strategies: Students form groups and go through the product design process with design thinking concepts and knowledge. They have to identify the problems (can be scientific investigation or social issues) and needs of specific clients through observation and analysis exercises. Besides, each group has to prepare a prototype. During the realization process, testing and modification of the prototype is always necessary. The presentation about their prototypes will be done among teachers and students.</p> <p>Lesson 1: Introduction of design thinking Students may give some tasks and exercises to understand how to tackle real world problems by follow the steps:</p> <ol style="list-style-type: none"> (1) Formulating problems (2) Seeking solutions (3) Thriving in uncertainty (4) Collaborating constantly and prototyping ideas (5) Iterating options and reflecting frequently <p>Lessons 2 – 5: STEM workshops Students may experience some more STEM workshops such as scientific investigation or social issues with data collection and analysis in order to understand what social/scientific problems we are facing. Student thinks about how to solve them.</p> <p>Lessons 6 – 9: Prototyping design Students group together to discuss and investigate the problems defined. They may continue working and processing the prototype that they have designed.</p>	<p><u>STEM</u> 10 double lessons per class, 4 classes (80 minutes each)</p> <p>(Total: 13 hours 20 minutes)</p>	<p>Science teachers + STEM and IT teachers</p>	<p>Students utilize the pitching skills to present their innovative idea of learning outcomes. They understand the frontier of STEM development.</p> <p>Students build up different generic skills when doing the projects.</p> <p>They integrate what they have learnt in STEM and they present and share ideas to others.</p>

Name of Activities	<p style="text-align: center;">Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M</p>	Number of sessions and total time	Teachers involved	Expected learning outcome
	<p>Lesson 10: Presentation Students present their prototype design among classmates to share different ideas and opinions. Students reflect what they have done.</p> <p>Key Learning Areas/ Subjects/ Learning elements: Science – 8.1 Simple circuit</p> <p>Technology – K2 Programming Concepts, K3 Materials and Resources, K5 Tools and Equipment, K6 Production Process, K9 Application of Systems, E7 Control and Automation</p> <p>Lessons 2 – 9: Science – Students may carry on scientific investigation via some experiments done in the lessons.</p> <p>Technology – Some experiments may involve food and nutrition and hence students understand more about the situation leading to enhance their design thinking skill. Programming is needed for data log in micro-processing controller.</p> <p>Mathematics – Students may collect and organize data before analysis.</p> <p>Lessons 6 – 10: Generic skills</p> <ul style="list-style-type: none"> • Communication skills – Students discuss with the situation and define problems. Also, they discuss with the prototype design. • Creativity – They may think of a new problem defined after investigations/ surveys / experiments. It enhances their creativity when designing their prototype. • Problem-solving skills – They may come across many difficulties and problem when handling the project, it enhances them to seek for solutions in different ways. • Collaboration skills – They should have better division of labour in order to complete the tasks smoothly. <p>Values & attitudes:</p> <ul style="list-style-type: none"> • Respect for others – Students accept opinions from different classmates and come up with a consensus. • Care for others – Students coordinate with one another and make things done. 			

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
<p>Activity 8</p> <p>Activities and Competitions held in Robotics Society, Enriched IT Class and IT Club</p>	<p>Target Group: S1 – S3 students (Students can select which clubs and societies they want to join)</p> <p><u>Robotics Society</u> Some activities will be held after school by the society. Students learn some more ideas about different robots and sensors.</p> <p>(1) Smart Boat Activity Students use the materials provided to them to assemble the smart boat. Then, they coded into a microcontroller and control. They test the boat on water using control to move in different directions.</p> <p>(2) Drone Training Course Students train with the drone competitions as follow: (i) Coding Competition: participants must programme to control the drone to fly and complete missions such as the designated orbital flight or crossing obstacles. (ii) Manual Control Competition: participants manually operate the drone to complete the mission.</p> <p>(3) Robotics Challenge Students code the micro-controller processor to do some robotics’ tasks such as bowling.</p> <p><u>Enriched IT Class (EITC) and IT Club</u> Different training workshops are held to let students learn more new technology and IT issues in the world.</p> <p>(1) AR and 3D Modelling Course Students learn about the use of AR, how to use an animation platform to perform AR application, increasing student interest about AR application. Also, design the 3D model using different 3D modelling platform and then use in an animation platform for designing more in AR.</p> <p>(2) Python Course / Pygame Course Students taste learning Python programming through interactive platforms so that students are familiar with text-based programming.</p> <p>(3) Robotic Course Students will learn to complete the tasks of combining Science and Engineering practice using a coding online platform. It involves coding to solve some problems. It comes up to competitions in this platform.</p>	<p><u>Robotics Society</u> At least 20 hours per term</p> <p><u>Enriched IT Class (EITC) and IT Club</u> At least 100 hours per term</p>	<p>STEM and IT teachers</p>	<p>Students enhance their STEM knowledge outside the textbooks. They integrate the STEM knowledge and enhance their deep learning for more challenges in competitions and training workshop.</p> <p>These latest technologies can widen their horizon.</p> <p>They also gain success when completing the tasks and become tech entrepreneur in the future.</p>

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
	<p>(4) Robotic Training Course</p> <ul style="list-style-type: none"> (i) Students will learn robotics with suitable robotic kits. They will learn how to control robots and use sensors. (ii) It trains students for advanced robotics with coding. (iii) It provides competition activity (such as Python Activity Challenge or compatible competitions) to elevate students' robotic coding ability. <p>(5) AI with App / Product Design Course Students will learn about what AI is and its applications, and create their mobile app/ product.</p> <p>(6) IoT Training Course</p> <ul style="list-style-type: none"> (i) It trains students for advanced IoT application training. (ii) It provides competition activity to elevate students' IoT coding ability. <p><u>Key Learning Areas/ Learning elements</u> <u>Robotics Society</u> Technology – Students learn how to code and store the programs into a microcontroller. Students also assemble their products with different tools. They may also need to use laser cutter and 3D printer to prototype their designs for competitions.</p> <p>Science – They need to know how to control the directions of smart boat and drone with the concepts of motor and gravity. Some Physics concepts such as force and direction, action and reaction may be included.</p> <p><u>Enriched IT Class (EITC) and IT Club</u> Technology – They learn how to program and link up to mobile applications or robots. They have to build up their robots for competitions. Science – Science concepts must be included when doing the challenges from competitions, such as force and motion, centre of gravity, torque and so on. It helps them understand how to solve problems easily.</p> <p>Mathematics – Calculations must be involved in their programs.</p> <p>Generic Skills for them: Communication and collaboration skills – they have to discuss with their partners when doing the tasks.</p>			

Name of Activities	Content (Include theme, implementation strategies/ mode, target groups, etc.) Science: S, Technology: T, Engineering: E, Mathematics: M	Number of sessions and total time	Teachers involved	Expected learning outcome
	Problem-solving and IT skills – they have to figure out how to solve the problems with coding before completion of the tasks. Creativity – they build up their mobile application according to the topics and situations.			

b. Teacher training

Activity 1: Teacher training workshops

Implementation Period:

07/2024 - 08/2024

Content:

- Teacher training workshops will be organized for teachers of STEM-related subjects. The content includes:
 1. Curriculum planning of STEM education
 - a. Discussion on forming learning and teaching schedule and activities
 - b. Duty allocation of STEM-related subjects' teachers
 2. The design and assessment of STEM-related learning activities
 - a. Building assessment rubrics

Number of sessions:

- 2 sessions, 3 hours/session

Teacher training conducted by school personnel/external instructor(s):

- Conducted by school staff

Expected outcomes:

- Teachers can understand the curriculum planning of STEM education and the design and focus of the STEM learning activities.

Activity 2: Teacher training workshops

Implementation Period:

09/2024 - 10/2024

Content:

- Teacher training workshops will be organized for teachers of STEM-related subjects. The content includes:
 1. 3D design and printing
 - a. Introduction to 3D modeling platform and tools
 - b. Printing out 3D artefact with 3D printer
 2. Use of microcontroller, IoT (Internet of Things) sensors and ready-made kits in STEM-related activities

Number of sessions:

- 2 sessions, 3 hours/session

Teacher training conducted by school personnel/external instructor(s):

- Conducted by school staff

Expected outcomes:

- Teachers will learn about the processing skills of using the STEM-related equipment

2.6 Budget

a. Staff cost

Post title	Full-time equivalent	Appointment requirements	Monthly salary	Mandatory Provident Fund	Employment period (months)	Amount (\$)	Justification
Sub-total on staff cost:						0	

b. Service cost

Item	Service details	Unit cost	Quantity	Amount (\$)	Justification
Apps School Subscription fee	An application for Mind Mapping (Individual user license)	HK\$25 (The subscription fee of this application is on an individual annual basis.	360	9,000	The application will be introduced to students in Activity 1. It allows students to share ideas through the Internet. It also provides opportunities to students to have the experiences in using applications to present ideas and design considerations through building Mind Map with the application. Besides, students' in other levels who have acquired this skill can use it to prepare thinking maps and mind maps in other problem-solving activities. The total number of students in junior forms is around 350 to 370. Therefore, the school should prepare sufficient account for individual user.
Apps School Subscription fee	An online platform that allows students to create and experience virtual reality (VR) and augmented reality (AR) content (school license)	HK\$12,000 (The subscription fee of this application is on a school annual basis.)	1	12,000	The application will be introduced to students in Activity 2. Students can also apply this knowledge in other activities especially Activity 8 to visualize and simulate ideas.
Sub-total on service cost:					21,000

c. Equipment cost

Item	Specifications	Unit cost	Quantity	Amount (\$)	Justification
A digital media player and streaming device	A digital media player and streaming device which allows wirelessly mirror or stream content from mobile devices also includes a voice-activated assistant	1,200	1	1,200	For students' presentation and teaching purpose (The device will be connected with the active panel to provide sharing and presenting functions through mobile devices. This kind of classroom setting can match with various types of sharing and presenting activities during lessons. The school has launched the Bring You Own Device (BYOD) measure to enhance the e-Learning environment. This kind of classroom setting can match with various presentation in class Activities 1 to 8.)
Active Panel	minimum 86" 4K Active Panel with cart wheel stand/ adjustable wall mount bracket	40,000	1	40,000	For teaching and learning purpose (In general, there are two usual methods used to present information. The LCD projector is a possible solution.

Item	Specifications	Unit cost	Quantity	Amount (\$)	Justification
					However, the active panel can provide an interactive and flexible platform for students and teachers to have sharing during lessons. Having an active panel is the best choice in enhancing interactive learning.)
LaserBox - Wireless Desktop Laser Cutter	Smart WiFi desktop laser cutter <ul style="list-style-type: none"> • Cutting area minimum 500 x 300mm • CO2 Laser tube type • Minimum 60W power 	60,000	1	60,000	Prepare components for prototyping (This is the most common type of Laser cutter. Due to the limitation of working space, the school will plan to order the desktop/ bench type instead of the floor type. Students will make use of the Laser Cutter to prepare parts of a smart car in Activity 5. Moreover, teachers can prepare assemble parts and workpieces for students to create a 3D hollow figure in Activity 3 for doing various designs and tests. Besides, this machine can apply to the process of prototyping in Activities 4, 7 and 8.)
Filament 3D printers	FDM 3D printer	5,500	6	33,000	Prepare components for various learning activities (3D printing skill will be frequently used in prototyping. Therefore, we must provide sufficient printer for students to practice and experience. Students will make use of the 3D printer to print objects in Activity 2, 5, 7 and 8.)
Chemical Cabinet	For storing chemicals (such as acetone and thinner)	5,000	1	5,000	For prototyping (Chemicals must store in a proper place. A cabinet with resistance material is needed such as stainless steel and polyethylene.)
FDM Filament Cabinet	For storing FDM filament with humidity and temperature control	5,000	1	5,000	For prototyping (The quality of 3D filament will be affected by the humidity and cause the filament to become fragile. Therefore, a cabinet with humidity control functions for keeping them is necessary.)
Cordless Power Hand Drill Set Kit	For prototyping and DIY project	2,000	6	12,000	For prototyping (There will be no more bench type drilling machine in the new D&T & Innovation STEM room. However, students still need to perform similar outcome such as drilling holes for screwing. The cordless power hand drill is commonly used nowadays to perform the same effect as the drilling machine. Besides, it can act like an electric screwdriver. In prototyping, drilling holes and screwing will appear very often. Therefore, power hand drills are needed. There is around 30 students in each class. Every 5 students will have to share one power hand drill. It can be applied to Activity 4, 7 and 8.)
Cordless Rotary Tool Kit	Cordless 18V One + flex-shaft rotary tool station	750	8	6,000	Prototype cutting, grinding, sanding, polishing and shaping (After printing out 3D objects, those unwanted support elements that were attached with the 3D artefact need to be removed. The cordless tool provides flexibility while working on tiny and precise artefacts after 3D printing. This tool can be applied in Activity 2. Also, students can prepare components in

Item	Specifications	Unit cost	Quantity	Amount (\$)	Justification
					Activity 5, 7 and 8 with this tool. In addition, it consists of different heads, bits and wheels that allow students to cut out parts easily in all activities. There is around 30 students in each class. Every 3 to 4 students will have to share one tool kit. They have to take turns to do the practice.)
Hand Tool Set with Solid Carrying Tool Box	Hand tool set for DIY project	500	16	8,000	For all DIY exercises (There is around 30 students in each class. Simple hand tools are needed for various working processes such as measuring, fixing, joining, screwing and holding workpieces. If possible, every student should have a set of simple hand tools to perform the working processes mentioned above. Due to the limitation of funding, 2 students will share one set of hand tools. The hand tools kit can be applied to a number of activities including Activity 1, 3, 4, 5, 7 and 8.)
Pocket Size Auto-Ranging Digital Multimeter	For electrical and electronic DIY project	250	10	2,500	For all electrical and electronics DIY project (An auto-ranging digital multimeter is needed for checking the condition of electric circuits. Nowadays, electronic sensors are widely applied in various kinds of system. Also, students may use electronic sensors in their project. Therefore, tools for debugging are necessary. The multimeter will be introduced to students for checking the conductivity and connections of components on an electric circuit. There is around 30 students in each class. Due to the limitation of funding, 3 students will share one multimeter. The multimeter can be applied to activities which include the process of building a circuit such as Activity 1, 3, 4, 7 and 8.)
Bench type Belt/Disc Combo Sander	For prototyping and DIY project	3,000	2	6,000	For prototyping (It helps shaping and sanding of workpiece. This tool will be introduced to students in activities that need to realize ideas, such as activities 1, 3, 4, 5, 7 and 8. There is around 30 students in each class. Due to the limitation of funding, students need to queue to use the sander for prototyping.)
Cordless Portable Dust Extractor	For collecting dust that produces from bench type belt/disc sander	3,500	2	7,000	For prototyping (Dust from sanders can be cleaned and removed easily. The dust extractor should be the most important extension part of the sander. Otherwise, the room will be full of dust.)
Microcontroller sensor kit	Microcontroller extension board and sensors	800	16	12,800	For prototyping in Activity 3 and Activity 4 (There is around 30 students in each class. Students have to work in pairs since the limited number of sensor kits.)
Movable student chairs	Stackable student chairs with transport trolley (at least 32 pieces)	350	32	11,200	Movable chairs can provide feasibilities to form various types of grouping or pair work environment for conducting

Item	Specifications	Unit cost	Quantity	Amount (\$)	Justification
					discussion, prototyping exercises and competitions.
Movable student tables	Movable folding tables (at least 16 pieces)	750	16	12,000	Movable tables can provide feasibilities to form various types of grouping or pair work environment for conducting discussion, prototyping exercises and competitions.
Movable teacher stool	Movable mobile teacher stool	1,500	1	1,500	Providing feasibilities for the teacher to deliver messages and conduct lessons.
Movable height adjustable teacher's bench	Movable height adjustable teacher's bench with storage area and electrical power sockets	7,099	1	7,099	A multipurpose teacher's bench for presenting, demonstrating and delivering teaching materials and exercise resources.
Sub-total on equipment cost :	230,299				

d. Works cost

Item	Works details	Amount(\$)	Justification
1	Installation of new socket & circuit box assembling <ul style="list-style-type: none"> 13A socket (at least 50) Suspended ceiling electrical sockets for group project prototyping (at least 5) LAN port (at least 5) Video and audio port (HDMI at least 2) Joining and assembling single phase and three phase circuit boxes 	50,000	At least 50 pieces of 13A socket around the room for connecting electrical devices such as soldering iron, bench type belt/disc combo sander, etc. At least 5 suspended 13A socket for project-based learning activities.
2	Wall, ceiling and floor refurbishing <ul style="list-style-type: none"> Flooring area is around 109 square metre (1173 square foot) Wall area is around 120 square metre (1292 square foot) Ceiling area is around 109 square metre (1173 square foot) 	100,000 55,000 35,000	The flooring area is round 109 square metre (1173 square foot). The ceiling height is around 3.9 metre. The total area of wall and ceiling that needs to refurbish will be around 230 square metre.
3	New Graffiti glass board for students to share ideas	20,000	The area is around 2 x 4 metre
4	Repartitioning of learning space and group discussion space	85,000	The existing partition wall is around 3 x 7 m. The working and prototyping area will be very noisy and full of dust. During prototyping activities especially the PBL project, very often group discussion activities and working activities will happen at the same time. The school would like to have a partition to provide save and suitable environment to cater for students' specific needs.
5	Installation of new partition between learning space and materials storage area	10,000	Currently, there is no partition between the materials storage area and the learning space. The dimension of the partition wall is around 2.5 x 4 m.

6	<p>Purchase of furniture</p> <ol style="list-style-type: none"> 1. Tailor-made movable strong working benches for group project prototyping. The dimension of the working surface of those benches should be at least 1370 x 1370 mm (at least 6 pieces). 2. Tailor-made movable hand tools storage units with electrical power sockets for group project prototyping. Cordless power tools and simple hand tools should be stored in it (at least 6 pieces). 3. Tailor-made acid and alkali resistance side bench cabinets around the walls of the STEM room. The estimated overall dimensions of each of them will be around 700 x 800 x 9000 mm (1 pcs), 700 x 800 x 4200 mm (1 pcs) and 700 x 800 x 7000 mm (1 pcs) respectively. 4. Tailor-made acid and alkali resistance sink cabinet. The estimated overall dimensions will be around 700 x 800 x 2000 mm 5. Tailor-made pull-out cabinets that should be big enough (at least 128 units which the total number of students in one level) for storing the projects of all junior form classes (S.1 to 3). The estimated overall dimensions will be around 800 x 3000 x 4000 mm (2 pcs.) 	180,000	<p>Movable benches can provide feasibilities to form various types of grouping patterns for conducting prototyping exercises and competitions. The material of working benches should be strong and thick enough to fix movable bench vice. In Activity 7, students will be separated into groups. The group size will be around 5 students each. They have to present a solution through the Engineering Design Process. According to the class size mentioned in those activities, the STEM room should equip at least 6 set of movable working benches and tools storage units for conducting the prototyping activities. The current Design and Technology (D&T) subject has some handy electric power tools that should be kept for future use such as strip heater, jigsaw, router, etc. Also, a number of useful large size hand tools should not be discarded, such as hacksaw, plane, box and spanner kit, etc. Students have been used these tools in participating previous external competitions. Under the situation mentioned above 50% of the space of the cabinet will be reserved for keeping those useful handy electric power tools and large size hand tools as well. The remaining 50% storing space of the cabinet will be reserved for storing workpieces during project work especially catering for Activity 7 and 8. For providing a save and well-organized environment for prototyping, learning and teaching environment, all resources, tools, project workpieces should be stored properly.</p>
7	New smart curtain	25,000	<p>The smart curtain is for blacking out purpose. On one side is with windows only, if there are no black out facilities or setting students should not be able to view the information on the active panel easily. Also, this may cause bad</p>

		effect to students' eyes. The dimension of smart curtain is around 15054mm x 2400mm.
Sub-total on works cost :		560,000

e. General expenses

Item	Amount (\$)	Justification
Consumables PLA 3D printing filament, Acrylic Sheet for Laser cutting purpose, Tensol solvent for joining pieces of Acrylic Sheet, Medium density fiberboard (MDF) for Laser cutting purpose,	6,666	For students and teachers' workshops
Sub-total on general expenses:		6,666

f. Contingency

Item	Amount (\$) (Round down to the nearest integer)	
Works contingency	56,000	
General contingency	7,735	
Sub-total on contingency:		63,735

g. Audit fee

	Amount (\$)	
Audit fee	5,000	
Sub-total on audit fee:		5,000
Total amount of funding sought:		886,700

3. Expected Project Outcomes

3.1 Deliverables/positive impact on the school's development

Item: Deliverables / outcomes and positive impact on the school's development

Students' work: Students' work will be exhibited for peers learning, students with extraordinary work will be encouraged to join external competitions.

Enhanced learning atmosphere: STEM activities include development of students' study skills via strengthening learning by explorations, investigations, e-learning and self-directed learning.

Enhanced collaboration between subject panels: During the development and implementation of the STEM curriculum, different subject panels are involved with ideas contributed and compromised.

3.2 Evaluation

Evaluation Method: Lesson/activity observation**Success criteria:****Students are able to:**

- follow teachers' instructions to complete specific tasks;
- use simple hand tools to realize their ideas;
- engage various kinds of problems;
- figure out various possible solutions to solve problems encountered;
- contribute, share and communicate with others.

Evaluation Method: Questionnaire**Success criteria:**

- By conducting year-end questionnaire survey, 80% of the teachers and students agree that the project helps the school promote STEM education
- By conducting year-end questionnaire survey, 80% of the teachers and students agree that the project helps arouse students' learning interest in STEM-related subjects
- By conducting year-end questionnaire survey, 80% of the teachers and students agree that the project can enhance students' creativity, collaboration and problem-solving skills
- By conducting year-end questionnaire survey, 80% of the teachers agree that the project can enhance their confidence in implementing STEM education

3.3 Sustainability of the project

- The curriculum will continue to be implemented and enhanced after the completion of the project.
- The relevant facilities and equipment will be properly used for learning and teaching activities after the completion of the project.
- Evaluation meetings will be held for the committee members and the teachers involved. They will discuss how to further develop the school-based STEM education and design learning and teaching activities of different themes.
- The maintenance fee and the purchase of new equipment of the "D&T cum STEM Room" in future will be borne by the school.

3.4 Dissemination

Item: Seminar/sharing session

Sharing sessions through different teacher professional exchange activities and networks will be organised for transfer of successful experience internally and externally.

When writing this proposal, did the school refer to the sample proposal/project(s) approved with funding support at the Quality Education Fund (QEF) website?

Yes

Relevant sample proposal number: S05

Approved project number:

Report Submission Schedule

The school commits to submit proper reports in strict accordance with the following schedule:

Project Management (Should be submitted via the “Electronic Project Management System” (EPMS))		Financial Management (Hard copy together with supporting documents should be submitted to the QEF Secretariat by mail or in person)	
Type of report and reporting period	Report due on	Type of report and reporting period	Report due on
Progress Report 01/03/2024 - 28/02/2025	31/03/2025	Interim Financial Report 01/03/2024 - 28/02/2025	31/03/2025
Final Report 01/03/2024 - 30/06/2025	30/09/2025	Final Financial Report 01/03/2025 - 30/06/2025	30/09/2025

Assets Usage Plan

Category	Item / Description	No. of Units	Total Cost (HK\$)	Plan for Deployment
Equipment	A digital media player and streaming device	1	1,200	The item will be continued to be used in teaching and learning after the completion of the project.
	Active Panel	1	40,000	
	LaserBox - Wireless Desktop Laser Cutter	1	60,000	
	Filament 3D printers	6	33,000	
	Chemical Cabinet	1	5,000	
	FDM Filament Cabinet	1	5,000	
	Cordless Power Hand Drill Set Kit	6	12,000	
	Bench type Belt/Disc Combo Sander	2	6,000	
	Cordless Portable Dust Extractor	2	7,000	
	Movable teacher stool	1	1,500	
	Movable height adjustable teacher’s bench	1	7,099	

Remarks

- The school will ensure the safety of students when conducting the learning activities. In relation to the equipment to be procured, the school will observe relevant safety guidelines and state the necessary measures to be taken to ensure the safety of students and staff.
- The school will observe all the rules and regulations on alteration to school premises (including structural alteration and conversion, etc.), if any, and seek approval from the respective Regional Education Office before project commencement.
- The school will ensure the openness, fairness and competitiveness of the procurement of goods and services, and conduct quotation/tendering in accordance with the QEF General Guidelines on Staff Administration and Procurement Matter to select the service provider(s).
- The school understands that the expenditure items funded by the QEF is one-off. The school takes responsibility on its own for the recurrent expenditure incurred, including maintenance costs, daily operating costs, etc. and the possible consequences that may arise.
- The school confirms that the copyrights of the deliverables/materials should be vested with the QEF. Any reproduction, adaptation, distribution, dissemination or making available of the deliverables to the public by the service provider for commercial purposes is strictly prohibited.