

**Quality Education Fund**  
**The Dedicated Funding Programme for Publicly-funded Schools**  
**Part B: Project Proposal**

|   |                                     |
|---|-------------------------------------|
| <b>Project Title:</b><br>School-based Junior Secondary STEM Education Programme | <b>Project Number:</b><br>2018/0593 |
|---|-------------------------------------|

**Name of School:** SKH Tang Shiu Kin Secondary School

**Direct Beneficiaries**

(a) Sector:  Kindergarten  Primary  Secondary  Special School (Please put a tick in the appropriate box(es).)

(b) Beneficiaries: (1) Students: 400 ; (2) Teachers: 20 ; (3) Parents: (N.A.) ;  
 (4) Others: (N.A.)

**Project Period:** 06/2020 to 05/2022

**1. Project Needs**

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|-----|---|---|
| 1.1 | Project Aim(s)                                | The goal of developing a school-based STEM course is to arouse students' interest in innovative technology. Through STEM-related subject knowledge together with the spirit of innovative technology, our school-based STEM education can help students enhance their understanding of new technology which can be closely linked to their daily life.  |
| 1.2 | Innovative element(s)                         | Junior form Computer Literacy and D&T curricula will be collaborated to conduct a school-based junior form STEM education, including mobile phone programming, robot programming, creative electronic design, VR/AR production and fabrication skills. Classroom design shifts from imparting knowledge to practice through learning. Students can develop their creativity, collaboration and problem-solving skills through teamwork, and integrate technology into life issues with an aim to improve their lives. The design and making of innovative products are also beneficial. The school is going to change an existing Computer Room and an adjacent classroom to form a "STEMER SPACE". It aims at providing venues and equipment which enable students to practice what they have learned and enrich their learning experiences. It is hoped that they will gain more learning outcomes through the practical experience of STEM |
| 1.3 | Alignment with school-based / students' needs | One of the key items of the school's three-year development plan (2018-2021) is to further develop the Technology Education curriculum by strengthening STEM Education. Our school's Computer, D&T and Science teachers have developed STEM activities planning and design. Students are expected to acquire and develop indispensable skills of the 21st century through STEM education.   |

**2. Project Feasibility**

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|-----|---|--|
| 2.1 | Key concept (s) / rationale(s) of the project   | The main idea of the project comes from the recommendations of the Education Report entitled 'Promotion of STEM Education - Unleashing Potential in Innovation'. (December 2016): reconstructing Computer and D&T subject into the junior STEM curriculum. Through class teaching, it enables students to be exposed to some new topics such as mobile phone programming, robot programming, creative electronic design, VR/AR production, IoT, A.I. and integrate them into real life situations. Also, it helps to cultivate students' creativity and apply what they have learnt in solving real-life problems. |
| 2.2 | Applicant's readiness or ability/ experience/ conditions/ facilities for project implementation | <ol style="list-style-type: none"> <li>1. Teachers are enthusiastic about STEM education. In the past 3 years, our teachers supervised many students to participate in different STEM competitions and got excellent results.</li> <li>2. The school provides computer science and design and technology curricula. In addition to teaching traditional course content, our school has added</li> </ol>  |

|     |   |  |
|-----|---|--|
|     |   | STEM-related topics in response to technological developments, such as robots, mobile phone programming, and 3D printing in recent years<br>3. This plan will renovate the computer room and the adjacent activity room into "STEMER SPACE", which can provide a well-equipped, spacious, and customized venue for different STEM activities, and can allow students to explore their creativity and get involved in STEM exploratory processes.   |
| 2.3 | Principal's and teachers' involvement and their roles | The school has established the STEM Learning and Teaching Development Team, which is headed by the Principal and a Vice-Principal. The team will lead the subject-related panel heads, and stipulate long-term sustainable development goals for STEM education. The Vice-Principal and the panel heads are responsible for arranging teachers to participate in appropriate training courses, equipping teachers as facilitators in STEM education, guiding students to integrate the knowledge of different subjects and cultivating their creativity, collaboration and problem-solving skills. |
| 2.4 | Parents' involvement / participation (if applicable)  | PTA will be informed of the school policy on implementing STEM education.  |
| 2.5 | Roles of collaborator(s) (if applicable)              | N/A  |

## 2.6 Implementation timeline

| Implementation period<br>(MM/YYYY) | Project activities   |
|------------------------------------|--|
| 06/2020                            | <ol style="list-style-type: none"> <li>1. Design the junior form STEM education plan and set its curriculum guidelines</li> <li>2. Conduct teacher training, including: curriculum planning, classroom activities, learning activities, cross-subject activities, assessment rubrics and teaching kits, etc.</li> </ol>  |
| 06/2020 – 08/2020                  | <ol style="list-style-type: none"> <li>1. Tender and renovate "STEMER SPACE"; purchase STEM-related equipment and teaching kits.</li> <li>2. Regularly hold teaching and preparation meetings, design teaching activities and prepare teaching plans.</li> <li>3. Establish a bank of learning and teaching resources, collect and organize learning resources for use in classroom and after-school activities.</li> <li>4. During the renovation project, Computer lessons will be conducted in classrooms.</li> </ol> |
| 09/2020 – 04/2022                  | <ol style="list-style-type: none"> <li>1. STEM-related learning activities will be organized for junior forms in "STEMER SPACE".</li> <li>2. "STEMER SPACE" is opened after school, for students to develop creativity by virtue of the equipment for creation. The school regularly holds interest courses to enable students to learn the latest STEM skills.</li> <li>3. Regularly review the progress and effectiveness of the STEM education and update and enrich the course content from time to time.</li> </ol> |
| 04/2022 – 05/2022                  | <ol style="list-style-type: none"> <li>1. All staff will review the effectiveness of the plan and discuss the next stage of development.</li> <li>2. Organize STEM sharing activities on campus to showcase student learning outcomes.</li> <li>3. Organize sharing sessions and invite primary and secondary school teachers in the district to share the results and experience of their projects.</li> </ol>  |

2.7 Details of project activities (Item (a)-(f) not applicable to this application can be deleted.)

a. Student activity, if applicable

| Activity name | Content<br>(Including the topics, implementation strategies/modes, target beneficiaries, selection criteria, etc.)   | Number of sessions and duration  | Teachers' involvement and/or hired personnel<br>(Including the roles, qualifications and experiences required of the speaker(s)/ instructor(s), etc.) | Expected learning outcomes  |
|---------------|--|--|---|---|
| S1 Curriculum | <p><u>First Term:</u></p> <ol style="list-style-type: none"> <li>1. Computer hardware and Computer Systems.</li> <li>2. : The content includes Blockly programming to develop VR projectors.</li> </ol> <p><u>Second Term:</u></p> <ol style="list-style-type: none"> <li>3. Robotics programming: The content includes coding, robot-making, moving control, use of ultrasonic sensors, line follower sensors, etc.</li> <li>4. creative electronics: The content includes: coding, use of electronic modules, integration of LED, touch sensor and sound module</li> <li>5. Use of fabrication tools (a joint venture with D&amp;T department)</li> </ol>  | <p>10 lessons, 40 minutes for each lesson;</p> <p>10 lessons, 40 minutes for each lesson</p> <p>10 lessons, 40 minutes for each lesson</p> <p>16 lessons, 40 minutes for each lesson</p> | <p>To be taught by school teachers with relevant knowledge and experience</p>   | <p>Students will understand hardware and software of a computer system.</p> <p>They will understand coding, robot-making as well as creative electronics.</p> <p>They can apply the relevant knowledge and skills to complete the related learning tasks.</p> <p>Students know the use of software and hardware for fabrications.</p> |
| S2 Curriculum | <p><u>First Term:</u></p> <ol style="list-style-type: none"> <li>1. Use of online office applications from and basic operations of database.</li> <li>2. : The content includes basic knowledge of electronics technology, basic operation of C language, overview of , Basic operation of I/Output Sensors. E.g. 3-color LED control, sound experiment, PWM photometric control, motor control, RC servo control, basic I / O control, Bluetooth control etc.</li> </ol> <p><u>Second Term:</u></p> <ol style="list-style-type: none"> <li>3. Development: The content includes 3D working environment, using sound, output and publishing, VR working environment, transition and audio effect, publishing to VR device.</li> <li>4. IoT and A.I.: The content includes: coding, use of electronic modules,</li> </ol> | <p>8 lessons, 40 minutes for each lesson</p> <p>10 lessons, 40 minutes for each lesson</p> <p>10 lessons, 40 minutes for each lesson</p> <p>10 lessons, 40 minutes</p>                   | <p>To be taught by school teachers with relevant knowledge and experience</p>   | <p>Students understand the use of to improve work efficiency.</p> <p>Students can understand about creative electronics. VR/AR development and Smart Home Development. They can apply the relevant knowledge and skills to complete the related learning tasks.</p> <p>Students know A.I and IoT technologies</p>                     |

|               |  |  |  |  |
|---------------|--|--|--|--|
|               | <p>Wi-Fi communication, electronic sensors to develop AIoT solution.</p> <p>5. Use of fabrication tools (a joint venture with D&amp;T department)</p> <p>6. Smart Plant Growing System: Use of and environmental sensors to develop a plant growing system.</p>  | <p>for each lesson</p> <p>8 lessons<br/>40 minutes for each lesson</p>   |  | <p>and integrate them to make AIoT solutions. Students know the use of software and hardware for fabrications.</p> <p>Students know the impact of technology.</p>  |
| S3 Curriculum | <p><u>First Term:</u></p> <p>1. Computer Network and Internet: Knowledge of networking and Internet.</p> <p><u>Second Term:</u></p> <p>2. Cyber Security</p> <p>3. smart car: The content includes: coding, use of electronic modules, integration of motor driver module, Bluetooth communication and TT motor, IR proximity sensor.</p> <p>4. Use of fabrication tools (a joint venture with D&amp;T department)</p> <p>5. App Inventor: The content includes coding, familiar with block editor, basic operation (Bluetooth communication, design of user interface, control of motors and servos).</p> | <p>18 lessons, 40 minutes for each lesson</p> <p>6 lessons, 40 minutes for each lesson</p> <p>12 lessons, 40 minutes for each lesson</p> <p>10 lessons, 40 minutes for each lesson</p> | To be taught by school teachers with relevant knowledge and experience | <p>Students understand relevant knowledge and pay attention to issues such as Internet security.</p> <p>Students can apply their knowledge and skills to complete the learning tasks. Their collaboration skills and problem-solving skills will be enhanced through the learning activities. They can also apply what they have learnt in solving real-life problems.</p> <p>Students will learn how to interact with machine via Bluetooth by developing Apps.</p> |

b. Teacher training, if applicable

| Activity name   | Content<br>(Including the topics, implementation strategies/modes, target beneficiaries, selection criteria, etc.) | Number of sessions and duration | Hired personnel<br>(Including the roles, qualifications and experiences required of the speaker(s)/ instructor(s), etc.) | Expected learning outcomes   |
|-----------------|--|---------------------------------|--|--|
| Workshop of     | Uses of Coding of  | 1 session, 2 hours              | Teacher of the school  | Teachers understand the use of VR in their subjects.   |
| Workshop of and | Examples of projects. Introduction of sensors, electronic and mechanical parts of                                  | 1 session 2 hours               | Teacher of the school  | Teachers of different subjects understand the use of to facilitate cross-subject activities. |
| Workshop of     | A workshop of developing a Smart Plant Growing System (Completed in Aug 2019)                                      | 4 sessions 8 hours              | Conducted by a company   | Smart Plant Growing System will be made by F.2 students collaborated by I.S and CML.         |

c. Equipment (including installation of new fixtures or facilities), if applicable

|   | Details of equipment to be procured              | Contribution to fulfillment of the project aim(s) and if applicable, the expected utilization rate           |
|---|--|--|
| 1 | Smart TV x2                                      | For interactive learning and teaching activities, mirroring of students computing devices for demonstration. |
| 2 | Network Attached Storage x1                      | For storage of students work.  |
| 3 | High performance Laptop x40                      | For learning and teaching activities especially for 3D modelling and VR production.                          |
| 4 | Access Point x3                                  | Wireless access allows ease grouping and collaboration works.  |
| 5 | Arduino-based circuit boards, sensors and motors | For learning and teaching activities   |
| 6 | Wireless Microphone System x2                    | For learning and teaching activities   |

Equipment purchased are used in all junior form computer lessons for learning computers knowledge, VR production, coding and tinkering. The utilization rate can be ascertained.

d. Construction works, if applicable

|   | Details of the construction works proposed  | Contribution to fulfillment of the project aim(s) and if applicable, the expected utilization rate  |
|---|---|---|
| 1 | The school computer room and adjacent activity room will be converted into "STEMER SPACE" (Note: Since the room is mainly used for computer lessons. The school will apply to the Education Bureau for reservation as a computer room). "STEMER SPACE" is composed by two rooms. One is used for computer design, programming, demonstration, group discussion and idea creation. Another room is for fabrication such as the use of 3D printers and laser cutters, as well as assembly of parts. |   |
|   | (a) relocate the lighting and sockets   | When the project is completed, the computer room and adjacent classroom room will be converted into "STEMER SPACE", which will help students to collaborate, inspire creativity, extend learning after class and explore and display students' works. |
|   | (b) set up graffiti walls   |   |
|   | (c) furniture   |   |

(Public sector primary and secondary schools, including DSS schools, and special schools should refer to Paragraph 8.6 and other relevant paragraphs in the *School Administration Guide*. Kindergartens under the New Kindergarten Education Scheme should observe Paragraph 1.2(1)(g) in the *Kindergarten Administration Guide*.)

STEMER SPACE is composed by 2 adjacent rooms. One is an existing Computer Room while another one is an un-used classroom. During the renovation project, Computer lessons will be conducted in classrooms. The school has enough classrooms to meet the needs of expansion of classes in future. Thus, the learning and teaching of Computer will not be affected.

Our school has obtained advice from REO that no permission is required for the renovation work of Computer Room and classroom next to it.

e. Features of the school-based curriculum to be developed, if applicable

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| To develop junior form STEM education, the school will merge the relevant learning content and the sequences of STEM-related subjects. The school-based STEM education will integrate the learning elements of each subject, add the learning units in S1 to S3 (mobile programming, robot programming, creative electronic design, VR/AR production 3D model design, A.I., IoT, etc.), and arrange after-school extended learning activities for students to integrate and apply their knowledge. Students will also use STEM knowledge to solve daily life problems. After students consolidate what they have learned, they can use creativity to enhance collaboration and abilities to solve problems. There is a plan to infuse STEM knowledge into F.2 IS curriculum to develop a plant-growing system. |
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f. Other activities, if applicable (Please specify how they contribute to fulfillment of the project aim(s).)

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| In the past years, our students joined the Young Engineers Program, they also won prizes  |
| The STEMER SPACE will be opened after school for more students to further develop their creativity and problem-solving skills and take part in different STEM-related competitions and learning activities. |

2.8 Budget

**Total Grant Sought: HK\$ 1,015,500 .00**

| Budget Categories*                | Breakdown for the budget items  |  | Justifications<br><i>(Please provide justification for each budget item, including the qualifications and experiences required of the hired personnel.)</i>  |
|-----------------------------------|---|--|--|
|                                   | Item  | Amount (HK\$)  |  |
| a. Equipment (\$653,700)          | Three Access Points   | 14,000   | For learning and teaching activities   |
|                                   | High Performance Laptops (40 units)   | 520,000  | For 3D modelling and VR productions.   |
|                                   | NAS 1TB   | 3,700  | For storing students' works  |
|                                   | Smart TVs (Two units)   | 100,000  | Interactive learning and teaching, mirroring of students' work for demonstration.  |
|                                   | Two Wireless Microphone Systems   | 6,000  | For conducting lessons   |
|                                   | -based electronic devices<br>5 sets of A.I. robot car<br>14 sets A.I. modules | 10,000   | For learning and teaching activities   |
| b. Works (\$346,800)              | Relocate power sockets  | 19,200   | Relocate 20 power sockets in order to have spacious area for conducting learning activities  |
|                                   | Network cabling   | 8,000  | Install 5 Lan Nodes in order to connect 3D printers, Laser Cutter  |
|                                   | LED Lighting (will be paid by school)   | 6,000  | Install 10 programmable LED lightings for students' learning and teaching activities   |
|                                   | Set up graffiti walls   | 33,600   | <u>STEMER SPACE Rm A</u><br>Advise to refurbish the floor and the wall; Install graffiti wall in order to facilitate students' group discussion, designing layout plan and planning for assignment progress<br><u>STEMER SPACE Rm B</u><br>Install Makers Tools Wall in order to store makers tool for student use   |
|                                   | Set up display walls  | 54,000   | <u>STEMER SPACE Rm A</u><br>Install 3 display walls in order to store and show students' work and projects   |
|                                   | Student Desk and chairs   | 78,000   | <u>STEMER SPACE Rm A</u><br>18 student desks and 40 chairs<br><u>STEMER SPACE Rm B</u><br>6 workshop tables in order to facilitate students' learning activities and making product  |
|                                   | Install half waist cabinet (will be paid by school)                           | 67,000   | <u>STEMER SPACE Rm A</u><br>Install 2 half waist cabinets in order to store STEM teaching materials<br><u>STEMER SPACE Rm B</u><br>Install 2 half waist cabinets in order to store STEM teaching materials   |
|                                   | Install full height cabinet   | 59,000   | <u>STEMER SPACE Rm A</u><br>Install 2 full height cabinets with graffiti surface in order to facilitate students' group discussion, designing layout plan and planning for assignment progress<br><u>STEMER SPACE Rm B</u><br>Install 1 full height cabinets with graffiti surface in order to facilitate students' group discussion, designing layout plan and planning for assignment progress |
| Charging cabinet                  | 22,000  | Install 1 charging cabinet for storing and charging 40 notebooks |  |
| b. General expenses (\$15,000)    | Audit Fee   | 15,000   | Audit Fee  |
|                                   |   |  |  |
| <b>Total Grant Sought (HK\$):</b> |   | <u>1,015,500</u>   |  |

Remarks

1. Our school will bear all possible consequences resulted from the related school premises alteration/improvement works, including but not limited to the provision of relevant grants, repair works, etc.
2. Our school understands that the expenditure items funded by the QEF is one-off. The applicant school is required to bear the recurrent expenditure incurred, including maintenance costs, daily operating costs, etc. and the possible consequences that may arise.
3. Our school will ensure that all procurement of goods and services is conducted on an open, fair and competitive basis with measures taken to avoid conflict of interests in the procurement process.
4. Our school will adopt relevant measures to ensure the safety of the users when using the equipment and implementing the project activities.

**3. Expected Project Outcomes**

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|-----|--|---|
| 3.1 | Deliverables / outcomes  | <input type="checkbox"/> ✓ Learning and teaching materials <input type="checkbox"/> Resource package<br><input type="checkbox"/> e-deliverables*( <i>please specify</i> ) _____<br><input type="checkbox"/> Others ( <i>please specify</i> ) _Students work<br><br>The school will share soft/ hard copies of learning and teaching materials. Students work will be displayed/ demonstrated to others.<br><i>*For e-deliverables to be hosted on HKEdCity, please liaise with HKEdCity at 2624 1000.</i> |
| 3.2 | Positive impact on quality education/ the school’s development | Academically, science and Mathematics knowledge will be improved. Creativity, problem-solving abilities and self-learning abilities of students will be further enhanced.   |

3.3 Evaluation

Please state the methodologies of evaluating project effectiveness and provide the success criteria.  
 (Examples: lesson observation, questionnaire survey, focus group interview, pre-test/post-test)

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| <ol style="list-style-type: none"> <li>1. Observing/implementing the effectiveness of the STEM education programme in the school-based junior forms by lessons observations, questionnaires and surveys (performance indicators: 80% of teachers and students agree that the project will help schools to promote STEM education)</li> <li>2. Enhance students' interest in learning (performance indicators: 80% of teachers and students agree that the program can help students learn STEM related subjects)</li> <li>3. Enhance students' creativity, collaboration and problem-solving skills (performance indicators: 80% of teachers and students agree that the program can help enhance students' relevant abilities)</li> <li>4. Enhance the professional competence of teachers (performance indicators: 80% of teachers believe that the program will help enhance their confidence in implementing STEM education)</li> </ol> |
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**For applications with grant sought exceeding \$200,000, please complete Parts 3.4 and 3.5.**

3.4 Sustainability of the project

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| <ol style="list-style-type: none"> <li>1. The school will hold a review meeting at the end of the program, and plan to continue to promote school-based STEM education and design learning and teaching activities on different topics.</li> <li>2. The school will be responsible for paying for the maintenance of STEMER SPACE and equipment as well as the purchase of additional items. After the completion of the program, the school will continue to make good use of relevant equipment to hold learning and teaching activities so as to enrich the students' learning experience.</li> </ol> |
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3.5 Dissemination

Please provide a dissemination plan for sharing the good value of the project with the school sector.  
 (Examples: dissemination seminar, learning circle)

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|---|
| <ol style="list-style-type: none"> <li>1. The school intends to hold a student achievement sharing meeting before the end of each school year, invite primary and secondary school teachers in the district to participate in the meeting, showcase students' learning outcomes, and share the content of the program and the experience of implementing STEM activities.</li> <li>2. Upload student products to the school website for teachers' and stakeholders' reference.</li> </ol> |
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#### 4. Asset Usage Plan

| Item/Description            | No. of units              | Total cost | Proposed Plan for Deployment   |
|-----------------------------|---------------------------|------------|--|
| Access Points               | 3                         | 14,000     | The equipment will be kept at school and continue to be used for implementing learning activities after the completion of the project. |
| High Performance Laptops    | 40                        | 520,000    |  |
| NAS 1TB                     | 1                         | 3,700      |  |
| Smart TVs                   | 2                         | 100,000    |  |
| Wireless Microphone Systems | 2                         | 6,000      |  |
| -based electronic devices   | Please provide the number | 10,000     |  |

#### 5. Report Submission Schedule

| Project Management                       |                | Financial Management                              |                |
|--|----------------|---|----------------|
| Type of Report and covering period       | Report Due Day | Type of Report and Covering period                | Report Due Day |
| Progress Report<br>1/6/2020 – 30/11/2020 | 31/12/2020     | Interim Financial Report<br>1/6/2020 – 30/11/2020 | 31/12/2020     |
| Progress Report<br>1/12/2020 – 31/5/2021 | 30/6/2021      | Interim Financial Report<br>1/12/2020 – 31/5/2021 | 30/6/2021      |
| Progress Report<br>1/6/2021 – 30/11/2021 | 31/12/2021     | Interim Financial Report<br>1/6/2021 – 30/11/2021 | 31/12/2021     |
| Final Report<br>1/6/2020 – 31/5/2022     | 31/8/2022      | Final Financial Report<br>1/12/2021 – 31/5/2022   | 31/8/2022      |