

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

Project Title: School-based Junior Secondary STEM Education Programme	Project Number: (To be assigned by the EPMS)
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Name of School: _____ Quality Education Secondary School _____

Direct Beneficiaries

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

(b) Beneficiaries: (1) Students: 360 (S1-S3); (2) Teachers: 15; (3) Parents: not applicable;
 (4) Others: not applicable

Project Period: 01/2019 to 07/2020

This template only serves as a reference. Items that are NOT applicable can be deleted as appropriate. A Guide to Applicants about the Dedicated Funding Programme for Publicly-funded Schools is available on the QEF website.

1. Project Needs

1.1	Project Aim(s)	The project aims at developing school-based junior secondary STEM education, arousing students' interest in learning STEM-related subjects and enhancing their creativity, collaboration and problem-solving skills. Moreover, the project will enhance teachers' professional capacity in implementing STEM education through the teachers' development programmes.
1.2	Innovative element(s)	The project consists of school-based innovative element. Our school has been organising STEM interest classes and pull-out gifted programmes on STEM since 2016 in order to nurture the students who are interested/have good performance in STEM learning activities. Our school plans to further promote STEM education through incorporating STEM education into daily learning and teaching. Students will be provided with opportunities for learning relevant knowledge and skills. Moreover, students will be allowed to gain more hands-on learning experience through the establishment of the "D&T cum STEM Room" with relevant equipment. Thus, they will have more opportunities to apply what they have learnt and their learning experiences will be enriched.
1.3	Alignment with school-based / students' needs	One of the focus of the school's three-year development plan (2016-2019) is to develop STEM education, to provide opportunities for students to have hands-on experience and apply what they have learnt 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	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)
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		<ul style="list-style-type: none"> - Enriching learning activities for students - Enhancing professional development for schools and teachers <p>We will review and modify the school-based junior secondary Mathematics and Science Education curricula. Learning activities, such as robotics, 3D printing, Mathematical Modeling and biotechnology, will be organised 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. Our school also plans to organise some training activities for teachers to enhance their professional capacity in designing and implementing STEM learning activities, hence enhancing the learning and teaching effectiveness.</p>
2.2	Applicant's readiness or ability/ experience/ conditions/ facilities for project implementation	Our school has been organising pull-out STEM education programme since 2016. We possess rich experience in organising relevant learning activities. According to our previous experience, students are interested in hands-on learning activities which can arouse their motivation in learning and exploring. Through these learning activities, students' creativity, collaboration skills and problem-solving skills can be enhanced. In order to further implement STEM education, our school plans to incorporate STEM education into junior secondary curriculum and establish a "D&T cum STEM Room" so as to provide valuable learning opportunities for all junior secondary students.
2.3	Principal's and teachers' involvement and their roles	<p>A coordinating committee, which comprises the principal, vice-principal and panel chairpersons of STEM-related subjects, will be set up to coordinate and monitor this project.</p> <p>Teachers from STEM-related subjects will participate in teachers' development programmes. They will be involved in reviewing the existing school-based curricula, developing and trying out the newly developed STEM education programmes. Peer lesson observations as well as cross-curricula collaboration and evaluation meetings will be conducted. Moreover, dissemination activities will be organised to showcase students' learning outcomes.</p>
2.4	Parents' involvement / participation (if applicable)	N/A
2.5	Roles of collaborator(s) (if applicable)	N/A

2.6 Implementation timeline

Implementation period (MM/YYYY)	Project activities
01/2019 – 03/2019	<ul style="list-style-type: none"> - Invite quotations for renovation of the "D&T cum STEM Room" and procurements of relevant equipment and materials - Hire the supply teacher and project assistant
04/2019 – 05/2019	<ul style="list-style-type: none"> - Conduct teacher training workshop (around 12 hours, including planning of STEM education programme, designing STEM learning activities and assessment, as well as training on relevant skills) - Review the existing STEM-related learning content and develop school-based STEM education programme for junior secondary students
06/2019 – 08/2019	- Design learning and teaching activities and lesson plans
09/2019	- Review the lesson plans and conduct pre-lesson meetings
10/2019 – 05/2020	- Conduct the learning activities for all junior secondary classes in the "D&T cum STEM Room"

	<ul style="list-style-type: none"> - Conduct extended learning activities for S3 students during Feb – May 2020 - Conduct lesson observations, and evaluate the progress of the project as well as the learning and teaching effectiveness. The learning and teaching activities will be refined if necessary.
06/2020	<ul style="list-style-type: none"> - The coordinating committee and the teachers involved will evaluate the effectiveness of the project, refine the developed curriculum and learning and teaching activities. They will also discuss how to further develop the school-based STEM education programme and relevant learning activities in the coming school year.
07/2020	<ul style="list-style-type: none"> - Organise STEM sharing session within school to showcase students' learning outcomes - Organise sharing seminars to share the project experience and project outcomes with the secondary teachers of the district

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 (Including the topics, implementation strategies/modes, target beneficiaries, selection criteria, etc.)	Number of sessions and duration	Teachers' involvement and/or hired personnel (Including the roles, qualifications and experiences required of the speaker(s)/ instructor(s), etc.)	Expected learning outcomes
1. Learning Activities: Robotics	To arrange the following learning activities for S1 – S3 students through incorporating the learning elements of STEM-related subjects: S1: Space Challenge S2: Speed Challenge S3: Sumo The content includes coding, robot-making as well as understanding the use of ultrasonic sensors.	6 sessions, 40 minutes for each session	To be taught by school teachers with relevant knowledge and experience	Students can understand about coding, robot-making as well as the use of ultrasonic sensors. They can apply the relevant knowledge and skills to complete the related learning tasks.
2. Learning Activities: Drawing, 3D design and printing	To arrange the following learning activities for S1 – S3 students through incorporating the learning elements of STEM-related subjects: S1: 3D design S2: Digital drawing S3: 3D design and printing The content includes drawing, different effects, principles of 3D printing, 3D model design and printing as well as model-making.	6 sessions, 40 minutes for each session	To be taught by school teachers with relevant knowledge and experience	Students can understand and apply the skills of drawing and 3D printing and complete the relevant learning tasks
3. Learning Activities: Mathematical Modeling	To arrange the following learning activities for S1 – S3 students through incorporating the learning elements of STEM-related subjects: S1: Design of 3D folding by using geometry S2: Simulate science experiments and explore the relationship of variables by using rate, ratio and algebra S3: Conduct Mathematical modeling	6 sessions, 40 minutes for each session	To be taught by school teachers with relevant knowledge and experience	Students can understand the concepts of algebra, geometry and statistics. They can adopt quantitative methods to investigate and solve problems related to scientific inquiry and technological design

	to quantify the feasibility of the technological design by using statistics and probability			through mathematical modeling as well as further analyse and deduce the reasonableness and feasibility of the problem-solving strategies in order to complete the relevant learning tasks.
4. Learning Activities: Biotechnology	To arrange learning activities for S1 – S3 students through incorporating the learning elements of Science: S1: Basic skills on microbiology experiments S2: Wine making using yeast S3: Food safety testing The content includes understanding of basic microbiology, the skills of handling apparatus and the design of simple scientific investigations	6 sessions, 40 minutes for each session	To be taught by school teachers with relevant knowledge and experience	Students can understand about the basic knowledge of microbiology and handling apparatus properly and, design simple scientific investigations to complete the learning tasks.
Extended learning activities: Apply the knowledge and solve the real-life problems	S3 students will form groups to complete an extended learning activity (projects / design and make activities).	The tasks will be completed after lessons.	STEM-related subject teachers will serve as mentors. They will monitor students' learning progress and advise on their work.	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.
STEM sharing session	This sharing session will be organised for the junior secondary students at the end of the school year. The sharing session will include students' sharing and booth displays which aim at summarising the project activities, consolidating students' learning experiences and showcasing their learning outcomes.	A half-day event	STEM-related subject teachers	This event can showcase students' learning outcomes, recognise their achievements and encourage them to explore further.

b. Teacher training, if applicable

Activity name	Content (Including the topics, implementation strategies/modes, target beneficiaries, selection criteria, etc.)	Number of sessions and duration	Hired personnel (Including the roles, qualifications and experiences required of the speaker(s)/ instructor(s), etc.)	Expected learning outcomes
Teacher training workshops (12 hours)	Teacher training workshops will be organised for teachers of STEM-related subjects. The content includes: 1. Curriculum planning of STEM education 2. The design and assessment of STEM-related learning activities 3. 3D design and printing 4. Mathematic modeling and quantified method in STEM-related	4 sessions, 3 hours for each session	- The trainer for curriculum planning of STEM education, design and assessment of STEM-related activities is required to have	Teachers can understand the curriculum planning of STEM education and the design and focus of the STEM learning activities. They also possess the skills of using the STEM-related

	activities		<p>an university degree, diploma in education or equivalent and at least 5 years of experience in curriculum planning and teaching</p> <ul style="list-style-type: none"> - The trainer for 3D design and printing is required to have relevant qualification and at least 1 year of experience in training. - The trainer for Mathematical modeling and quantified method in STEM-related activities is required to have a relevant university degree, diploma in education or equivalent and at least 3 years of experience in training. 	equipment.
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c. Equipment (including installation of new fixtures or facilities), if applicable

	Details of equipment to be procured	Contribution to fulfilment of the project aim(s) and if applicable, the expected utilization rate
1	One notebook computer	For developing learning and teaching resources
2	Two 3D printers	For learning and teaching activities
3	12 sets of robotic kits	For learning and teaching activities
4	24 sets of sensors	For learning and teaching activities
5	20 sets of biological technology experimental kits	For learning and teaching activities
6	One video recorder	For lesson observation and recording project activities
7	One projector	For conducting lessons

d. Construction works, if applicable

	Details of the construction works proposed	Contribution to fulfilment of the project aim(s) and if applicable, the expected utilization rate
1	To change the Design and Technology Room to “D&T cum STEM Room” (Note: The room will still be mainly used for design and technology education. Thus, the school will apply to the EDB for retaining the Design and Technological Room.	The proposed work will help well optimise the utilisation of space in the current Design and Technology Room. It will be converted into a Design, Technology and “D&T cum STEM Room”. The new
	(a) Relocate light and power sockets	
	(b) Refurbish the floor and the wall	
	(c) Install graffiti walls	
	(d) Purchase of furniture	

	settings will facilitate group discussions among students and display of students' work.
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(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.)

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

Our school plans to develop the school-based STEM education programme for junior secondary students by reviewing the learning sequence and content of STEM-related subjects, adding four learning modules (robotics, 3D printing, Mathematical modeling and biotechnology) for S1-S3. Extended learning activities will be arranged for S3 students. They will be provided with opportunities to apply what they have learnt to solve the real-life problems and show their creativity. Their learning will be consolidated and their collaboration and problem-solving skills will be enhanced.

f. Other activities, if applicable (Please specify how they contribute to fulfilment of the project aim(s).)

N/A

2.8 Budget

Total Grant Sought: HK\$ 1,097,391

Budget Categories*	Breakdown for the budget items		Justifications <i>(Please provide justification for each budget item, including the qualifications and experiences required of the hired personnel.)</i>
	Item	Amount (HK\$)	
a. Staff	1. Project assistant (17 months, including MPF) (HK\$13,500 x 17 x 1.05)	HK\$240,975	The candidate should have a university degree in computing or related disciplines. He/she will be responsible for: <ul style="list-style-type: none"> - arranging project activities and clerical work - arranging procurements - photo-taking and video-recording
	2. Supply teacher (Graduate) (17 months, including MPF) (For releasing the workload of the project leader and three panel chairpersons) (HK\$28,865 x 17 x 1.05)	HK\$515,240	The candidate should have a university degree in STEM-related disciplines and diploma of education or equivalent. He/she will be responsible for: <ul style="list-style-type: none"> - taking up the teaching duties of the teachers involved in the project - designing and compiling the learning and teaching resources - assisting in the implementation of the project activities and serving as a mentor for the

			extended learning activities for S3 students
b. Service	Conducting teacher training workshops 1. Curriculum planning of STEM education, design of learning activities and assessment (HK\$900 X 6)	HK\$5,400	Conducting teacher development workshops to facilitate them in designing and promoting school-based STEM education.
	2. 3D design and printing (HK\$500 X 3)	HK\$1,500	Conducting 3D printing training programme for teachers in order to equip them with relevant knowledge and skills
	3. Mathematical modeling and quantified method in STEM activities (HK\$900 X 3)	HK\$2,700	Equipping teachers with the knowledge and skills to design and conduct STEM learning activities
c. Equipment	One notebook computer	HK\$5,700	For developing learning and teaching resources
	Two 3D printers	HK\$40,000	For learning and teaching activities
	12 sets of robotic kits	HK\$56,400	For learning and teaching activities
	24 sets of sensors	HK\$12,000	For learning and teaching activities
	20 sets of biotechnology experimental kits	HK\$50,000	For learning and teaching activities
	One video recorder	HK\$4,500	For lesson observation and recording project activities
	One projector	HK\$6,000	For conducting lessons
d. Works	Relocate light and power sockets	HK\$30,000	Relocate light and power sockets in order to have spacious area for conducting learning activities
	Refurbish the floor and the wall	HK\$45,000	Advise to refurbish the floor and the wall
	Install graffiti wall	HK\$15,000	Install graffiti wall in order to facilitate students' group discussion, designing layout plan and planning for assignment progress
	purchase of furniture	HK\$20,000	To tailor make 4.5m half-height cabinet, a 4.5m full-height cabinet and a set of cupboard for storing and showcasing students' work
e. General expenses	Consuming materials for biotechnology	HK\$10,000	For conducting learning and teaching activities
	miscellaneous	HK\$5,000	Including photocopying and materials for learning activities etc
f. Contingency	Contingency fee for Works	HK\$11,000	(d x 10%)
	Contingency fee	HK\$5,976	[(b+c+e) x 3%]
g. Audit fee		HK\$15,000	
Total Grant Sought (HK\$):		HK\$ 1,097,391	

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(i) Applicants should refer to the *QEF Pricing Standards* in completing the above table. All staff recruitment and procurement of goods and services should be carried out on an open, fair and competitive basis. Budget categories not applicable to this

application can be deleted.

(ii) For applications involving school improvement works, a contingency provision of not more than 10% for carrying out works is considered acceptable.

(iii) For projects lasting for more than one year, a contingency provision of not more than 3% of the total budget exclusive of staff cost and works expenditure (including the related contingency provision), if any, is considered acceptable.

3. Expected Project Outcomes

3.1	Deliverables / outcomes	<input checked="" type="checkbox"/> Learning and teaching materials <input checked="" type="checkbox"/> Resource package <input type="checkbox"/> e-deliverables* (please specify) _____ <input checked="" type="checkbox"/> Others (please specify) _____ - Learning and teaching resources, including robotics, 3D printing, Mathematical modeling and biological technology for junior secondary students - Students' work <i>* For e-deliverables to be hosted on HKEdCity, please liaise with HKEdCity at 2624 1000.</i>
. 2	Positive impact on quality education/ the school's development	The project will help the school plan and develop STEM education systematically and nurture students to be learners in the 21 st century through the establishment of the "D&T cum STEM Room", curriculum development and teachers' development programmes.

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)

The project will be evaluated through observation, questionnaire surveys, group interviews and students' performance in STEM-related subjects. The evaluation items are listed below.

1. The effectiveness of the school-based STEM education programme for junior secondary students (success criteria: 80% of the teachers and students agree that the project helps the school promote STEM education)
2. To arouse students' learning interest (success criteria: 80% of the teachers and students agree that the project helps arouse students' learning interest in STEM-related subjects)
3. To arouse students' creativity, collaboration and problem-solving skills (success criteria: 80% of the teachers and students agree that the project can help enhance students' creativity, collaboration and problem-solving skills)
4. To enhance teachers' professional capacity (80% of the teachers agree that the project can help enhance their confidence in implementing STEM education)

For applications with grant sought exceeding \$200,000, please complete Parts 3.4 and 3.5.

3.4 Sustainability of the project

- By the end of the project, an evaluation meeting 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.

3.5 Dissemination

Please provide a dissemination plan for sharing the good value of the project with the school sector.

(Examples: dissemination seminar, learning circle)

- The school plans to organise a sharing seminar for the teachers of the district by the end of the project period so as to showcase students' learning outcomes, share the project experience and tips for implementing STEM learning activities.
- The deliverables will be uploaded to the school webpage and the Hong Kong Education City for teachers' reference.