

Quality Education Fund
Application with Grant Sought Not Exceeding \$200,000
Part B: Project Proposal

| Project Title | Project Number |
|-------------------------------------------------------------------------------------------------|-----------------------|
| Developing geographical and scientific minds through inquiry-based investigation on air quality | 2017/0418 (Revised) |

Basic Information

Po Leung Kuk Laws Foundation College

Beneficiaries

- (a) Sector: Kindergarten Primary Secondary Special
(Please tick the appropriate box(es))
- (b) Students: 50 (in number)* and S1 – S6 (class level/age)*
- (c) Teachers: _____ (in number)*
- (d) Parents: _____ (in number)*
- (e) Participating Schools (excluding applicant school): _____ (in number and types)*
- (f) Others (please specify): _____

* Please specify where appropriate

Proposal

(I) Project Needs

- (a) Please state the aims of the project in clear and concise terms and elaborate on how the proposed project could impact on school development.
- Through the processes of geographical and scientific investigation of air quality in relation to environmental conditions, students construct their scientific and geographical knowledge (e.g. relevant theories and concepts), skills (e.g. data sampling skill) and attitude (e.g. mind of pursuing for accuracy and precision)
- (b)
- (i) What are the areas of the needs and priorities of the school?
(Please tick the appropriate box(es))
- Enhance learning and teaching to facilitate students' knowledge on subjects / learning areas / generic skills development
- Promote students' social and emotional development
- Enhance school management / leadership and teachers' professional development / wellness

Others (please specify) _____

(ii) Please give background information to justify the demonstrated needs as mentioned in (b)(i).

(Please tick the appropriate box(es))

School development plan:

- The subject Geography in the school is committed to develop its role in inquiry-based learning. Since 2007, teachers of Geography and Liberal Studies have led students to carry out more than 15 long-term environmental investigations (over 6 months each), covering aspects on river quality, horseshoe crabs (endangered marine animal), urban heat island effect, light pollution, mangroves growth etc.
- After years of implementation, these long term environmental investigations are found to be arousing the geographical and scientific minds of students, developing their logical thinking, skills on research designs and data analysis, finally contributing to their learning of geography and other subjects, e.g. Liberal Studies, in formal lessons.

Survey findings: _____

Literature review summary: _____

Assessments on students' performance: _____

Relevant experiences:

- In Nov 2015, a team of 15 students received their training on air quality monitoring. The training was offered by the Division of Environment and Sustainability, HKUST. Students learnt the theory and methods in measuring various air pollutants (Suspended Particulates, NO₂, O₃) with laboratory techniques.
- Since then, students started their environmental survey of air quality in the campus (as one single sampling point), with the experiment setup offered by the HKUST. The survey started from Dec 2015 to May 2016.
- During this six-month survey, students also measured the atmospheric conditions, including air temperature, wind speed and direction, air pressure and visibility. These atmospheric conditions were correlated to the levels of the pollutants. Sources and pattern of air pollution in the campus are thus identified. In Jul 2016, students presented their findings in school, as well as in an international youth conference held in Aalborg, Denmark.
- In the evaluation of the above-said activity, teachers and students find it necessary to deploy better measuring devices, for an automated, accurate, precise data recording process with a larger sampling area and higher frequency of sampling (esp. during ordinary lesson time).
- Portable and mobile devices are suggested to extend this learning program. With the support of better devices, investigation on the air quality in relation to the environment outside the campus becomes feasible.

Others (please specify) _____

(c) Please elaborate on the innovative ideas or new practices to enhance, adapt, complement and/or supplement the existing practices that will facilitate the development of the school to address the needs specific to its own context.

- The introduction of air quality monitoring devices empowers students to develop many geographical investigations on the environment. Such environmental investigation gives students first-hand experience in the nature of air pollution, which is ubiquitous, invisible but risking health. With the support of scientific devices, air pollutants are “visualized”. Students explore the geographical and scientific concepts, and provide solutions to the problem based on their own findings.
- In long run, this mode of inquiry-based learning can be extended to areas of other environmental issues. e.g. water quality, noise pollution, light pollution etc., catering the diverse learning interests and different needs of students.

(II) Project Feasibility

(a) Please describe the design of the project, including:

(i) Approach/Design/Activity (Applicants are advised to provide details on project activities as well as learning and teaching arrangements.)

- This project adopts the inquiry-based strategy. This strategy has long been used in the school’s previous environmental investigations. In this strategy, teachers serve as facilitators. Students are grouped on mixed-ability and mixed-level basis. It is planned that each group would have 6 to 10 students. This group size allows students to have frequent sampling in the field/outdoor environment by rotation, avoiding burden on particular students. Students can also have sufficient discussion among during data analysis and presentations.
- Senior form students are expected to be the leaders of the groups, leading the members from junior forms on high-order tasks, for instance, setting hypothesis, turning preliminary ideas on investigations into concrete plans etc.; whereas junior form students are expected to carry out tasks on literature review (collecting relevant news etc.), carrying out data collection practically, compiling data for presentations etc.
- Students are asked to discuss and design their own environmental investigations under the theme “air pollution” (hypothesis-setting).
- They are expected to deploy the devices at their designated locations and collect data on various air pollutants (sampling design & data collection).
- Under the guidance and advices of teachers, students learn to analyze the data with appropriate statistical and/or graphical methods. Geographic Information System (GIS) software will be used for the spatial and temporal analysis of the data recorded.

Air pollutant levels recorded by the Environmental Protection Department will also be used for comparison. Through comparing different data sets, students understand the strength and limitation of their investigations (data analysis).

- Finally, students are asked to present their findings in form of oral presentations and posters in the school (data presentation). The products of the investigations will be shared to the public and other schools in public seminars and workshops.
- The project will be evaluated by the teachers and students involved. The same set of devices will be deployed again in the forthcoming academic year with new groups of students and new environmental investigation.

(ii) Key Implementation Details

Project period: Jan 2019 to Dec 2019

| Month / Year | Content / Activity / Event | Target Beneficiary/ Participants |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Jan 2019 | Recruitment of students | 50 students from all levels |
| Jan – Feb 2019 | Commencement of the environmental investigations in groups under teachers' guidance (hypothesis-setting & sampling design) | |
| Feb – Sep 2019 | Deployment of devices at different locations, according to students' sampling design (data collection) | |
| Apr – Oct 2019 | Continuous analysis and discussion with students with the aid of Geographic Information System. Teachers give feedback to students and fine-tune their design on the investigation (data analysis) | |
| Oct - Dec 2019 | Data presentation and sharing on the learning experience in groups by students (data presentation) | Whole school |
| Dec 2019 | Evaluation of the project through teachers' observation and students' focus group interview | The teachers and students involved in the project |

(b) Please explain the extent of teachers' and/or principal's involvement and their roles in the project.

(i) Number of teachers involved and degree of input (time, types, etc.):

- Three teachers with Geography and/or Liberal Studies background are the key personnel of the project. They are responsible to administer the

program and provide guidance and technical support to students. Frequent meetings and follow up (at least 3 per month) with students is required for the discussion on sampling design, preliminary data trend, drafting presentation materials etc.

- Teachers have a high level of involvement in each and every stage of the investigation (from hypothesis-setting to data presentation). Through frequent meetings with students (lunch time/ after school period), teachers respond to the progress and difficulties of students. To maintain the inquiry-based nature of learning, students are asked to explore more information based on teachers' comments, and report during the subsequent meetings.
- Through this repeated trial-report mechanism, students finally able to carry out feasible environmental investigations with reasonable breadth and depth. These investigation topics shall be related to the context of Geography. Some possible examples include *Relationship among levels of air pollutants and weather conditions*; *Spatial difference of air pollution levels at road junctions and roadsides*; *Effectiveness of urban parks in reducing air pollution level* etc.
- Teachers of English Language will also be involved at later stage when students are about to present their findings.

(ii) Roles of teachers in the project:

(Please tick the appropriate box(es))

- Leader
 Co-ordinator
 Developer
 Service recipient
 Others (please specify) Facilitator

(c) Please provide the budget of the project and justify the major items involved.

Grant Sought: HK\$200,000

| Budget Item* | Expenditure Detail (Including the breakdown for the budget items) | | Justifications |
|--------------|-------------------------------------------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Item | Amount (\$) | |
| i) Equipment | O ₃ monitoring devices x 3 | 38,550 | These five pollutants correspond to the pollutants composing the Air Quality Health Index. Data collected by students will be compared to those recorded by the Environmental Protection Department for further analysis |
| | CO monitoring devices x 3 | 38,550 | |
| | PM _{2.5} & PM ₁₀ monitoring devices x 2 | 40,800 | |
| | NO ₂ monitoring devices x 3 | 38,550 | |
| | SO ₂ monitoring devices x 3 | 38,550 | |

| | | | |
|---------------------------------|-----------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| | | | These devices allow automated, accurate, precise data recording process with a larger sampling area and higher frequency of sampling. |
| ii) General expenses | Audit fee | 5,000 | |
| Total Grant Sought (\$): | | <u>200,000</u> | |

** Please cross out as appropriate*

(III) Expected Project Outcomes

- (i) Please describe how to evaluate the effectiveness of the project.
(Please tick the appropriate box(es))

Observation:

- Teachers of the project are served as facilitators. They interact directly with different groups of students regularly (at least 3 per months) and observe their progress and performance.
- Successful criteria include (1) comprehensive planning of the investigation; (2) forecast possible difficulties in the environmental investigation; (3) draw meaningful conclusion from the data collected; and (4) employ appropriate graphical and statistical methods in presenting the data.

Focused group interviews:

- Individual students will be invited to share their learning progress and provide feedback. Teachers evaluate the effectiveness of the project based on their own observations and feedbacks from students.

Pre-and post-activity surveys: _____

Performance change of students in assessment: _____

Others (please specify) _____

- (ii) Please state the project deliverables or outcomes.
(Please tick the appropriate box(es))

Learning and teaching materials

- (1) Information sets (PowerPoint, worksheets, reading materials etc.) on air pollution and air pollutants; (2) guidelines and instructions on the skills of air quality monitoring; and (3) products derived from students' investigations (PowerPoint, poster) will be documented as the Learning and Teaching materials for teachers.
- Such materials are also served as exemplars to forthcoming students in the

future.

- To extend the positive impact of the project, the school will share the experience and project deliverables with the education sector and the general public through uploading the students' work (e.g. research posters, PowerPoint presentations etc.) to the school website.

- Resource package
- DVD
- Others (please specify) _____

Assets Usage Plan

| Category (in alphabetical order) | Item / Description | No. of Units | Total Cost | Proposed Plan for Deployment (<i>Note</i>) |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| audio and video equipment | | | | |
| book & VCD | | | | |
| computer hardware | | | | |
| computer software | | | | |
| musical instrument | | | | |
| office equipment | | | | |
| office furniture | | | | |
| sports equipment | | | | |
| Others | Devices for measuring various air pollutants (O ₃ , CO, PM _{2.5} & PM ₁₀ , NO ₂ , SO ₂) | 14 | 195,000 | The devices will be deployed to subsequent environmental investigation projects relevant to air quality in the future. The devices will become the assets of and to be managed by the Department of Geography. |

Note: for use by school / organization / in other projects (please provide details of the department / centre to which the asset will be deployed and the planned usage of the asset in activities upon project completion).

Report Submission Schedule

I / My school / My organization commit(s) to submit proper reports in strict accordance with the following schedule :

| Project Management | | Financial Management | |
|---------------------------------------|----------------|-------------------------------------------------|----------------|
| Type of Report and covering period | Report due day | Type of Report and covering period | Report due day |
| Final Report 1/1/2019 - 31/12/2019 | 31/3/2020 | Final Financial Report 1/1/2019 - 31/12/2019 | 31/3/2020 |