

Part C Project Details

1. Goals and Objectives

Goals

- (1) Short term: To shoulder the community responsibility and contribute our expertise and strengths in nurturing gifted students during the transitional period of the New Senior Secondary (NSS) reform.
- (2) Medium term: To support the shift of pedagogy from traditional content-based and teacher-centred teaching to metacognition-focused and student-oriented learning.
- (3) Long term: To enlarge the pool of talented youngsters who could appreciate the importance of science and its power. Their pursuit of a science-related career will give rise to an assembly of talented, scientifically literate members of our community whose endeavours can enhance the prosperity and stability of an increasingly scientific, knowledge-based and technologically advanced society.

Objectives

- (1) Build on the success of the previously funded QEF project “A Science Enrichment Programme for Secondary 3-4 Students” to implement a 3-stage Science Enrichment Programme to a group of S3-4 students.
- (2) Organise a series of professional development workshops for teachers.
- (3) Design a set of instruments with a focus on higher order thinking capability and creativity for the early identification of students who are exceptionally gifted in science.
- (4) Develop and disseminate a set of teaching and learning resources in science that foster a cultural of metacognition-focused and student-oriented learning.

2. Needs Assessment and Applicant's Capability

(a) Background

The present project is built on the success of the QEF project “A Science Enrichment Programme for Secondary 3-4 Students” that was funded in the year 2005 (QEF Ref No. 2005/0349). For ease of reference and clarity in presentation, the previously funded project and the associated enrichment programme will be addressed as “S3-4 Project” and “S3-4 Enrichment Programme” respectively in the present proposal.

Stretching student potential and catering for learner differences are regarded as crucial components in the NSS reform, and strategies and specific action plans for gifted education have been formulated (EMB, 2005, Chapter 6). As a responsible stakeholder, the Faculty of Science at The Chinese University of Hong Kong (CUHK) has been actively engaging in various dimensions of the NSS reform with a number of contributions. Specifically, we have been working closely with the Curriculum Development Institute (CDI) of the Education Bureau (EDB), and our concerted effort has led to the aforementioned S3-4 Project.

The S3-4 Enrichment Programme is currently in its third stage of implementation, and will be completed in August 2008. The Project has been closely monitored and thoroughly assessed by the Centre for Learning Enhancement And Research (CLEAR), a unit external to the Science Faculty and responsible for spearheading CUHK's mission on high quality teaching and learning. A very comprehensive self-evaluation plan has been implemented. The plan includes thorough evaluation of each individual activity in all phases. Self-reflections are periodically conducted based on the evaluation results derived from analysing feedback collected from teachers and students using both qualitative and quantitative methods. The feedback collected so far was extremely positive and very promising. In view of clear evidence of success, students, parents, teachers, educational leaders and administrators all call for further development of the programme. All stakeholders are of the view that cultivating science

talents from an early age at school is one of the most important priorities among multiple and competing ones, and merits utmost attention. They also have the opinion that only limited science resources exist to support student-oriented pedagogy which can enhance students' in-depth intellectual capacity and complex problem-solving skills. Moreover, the community is in need of programmes for students gifted in science and specific instruments for early identification. It is imperative for the higher education sector to be involved with gifted education and to develop resources to support gifted education, especially during this transitional period of educational reform. Acting on initiative and being responsive to the community, the Science Faculty at CUHK decided to undertake the proposed project with a view to attending to the urgent needs in the sector.

(b) Readiness of the applicant organisation for undertaking the project

The Commitment of the Faculty of Science

The Faculty of Science at CUHK has declared its mission as "achieving excellence in teaching by designing and offering innovative programmes". The Faculty has long been committed with enormous and unyielding efforts to offer its expertise and facilities to promote science educations at all levels. It has a broad and well-built structure that consists of biological, mathematical and physical science disciplines, and offers a wide range of undergraduate and graduate programmes, including Biology, Chemistry, Biochemistry, Chinese Medicine, Environmental Science, Food and Nutritional Sciences, Mathematics, Molecular Biotechnology, Physics, Risk Management Science and Statistics. The Science Faculty, which enjoys the robust support from its constituent units and the strong assistance from the central administration of CUHK, has encompassed all the necessary facilities, infrastructure, experience, expertise, competence and commitment to successfully achieve the goals and objectives of the project. Moreover, the project will receive an immense support from CLEAR that will closely monitor and evaluate the project with a view to attaining high quality assurance.

Collaboration with EDB

The Faculty has established a very close working relationship with CDI, members of which will continue to participate as external advisers in the proposed project. The team of the S3-4 Project with dedicated and experienced exemplary teachers from each department of the Faculty will continue to take up major roles in the proposed project. It will be led by the senior management of the Faculty and supported by different units of CUHK. The structure of the project team is as follows:

<i>Project Leader</i>
• Prof Poon Wai Yin
<i>Deputy Project Leader</i>
• Prof Chan Raymond HF
• Prof Kwan Hoi Shan
• Prof Ng Dennis KP
<i>Evaluation Team Leader</i>
• Prof Carmel McNaught

<i>Disciplinary Coordinators</i>
• Prof Cheung Siu Hung
• Dr Cheung Leung Fu
• Dr Chung Kwok Cheong
• Prof Kong Siu Kai
• Dr Tong Shiu Sing
• Prof Tsang Paul WK
• Dr Wong Jeff CF
<i>Evaluation Team Coordinator</i>
• Prof Lam Paul LC
<i>External Advisers</i>
• Ms Chung Irene OL
• Mr Fong Raymond WH
• Dr Fung Leo SW
• Mr Lau Yiu Hon
• Mr Lee Pak Leung
• Mr Leung Joseph KT
• Ms Lui Grace MY
• Mr Wong Chung Po
• Mr Yu Hon Yui

(c) The applicant organisation's experience in gifted education

Enrichment Programme for Young Mathematics Talents

The Faculty is proud of its highly reputable "Enrichment Programme for Young Mathematics Talents (EPYMT)" jointly offered by the Mathematics Department and the Institute of Mathematical Sciences. The programme was initially started with a private donation, and course activities in the years 2004 to 2005 were supported by QEF (QEF Ref No. 2002/0354). The courses are specially designed for talented high school students. Each year, the programme provides comprehensive mathematics courses for students in S5 to S7 with a yearly enrolment of about 200. One prominent feature of the programme lies in its having a prestigious academic leadership with an Advisory Board of some 15 top-echelon mathematicians. EPYMT provides inspirational and intensive courses with topics reaching the level of university final year. In addition to lectures, there are tutorial sessions with a high teacher-to-student ratio. The programme has rapidly earned recognition and becomes highly reputable in the community, laying a solid foundation for the subsequent development of enrichment programmes in the Faculty.

Enrichment Programme for Physics Talents

The Physics Department has organised an "Enrichment Programme for Physics Talents" since 2004 for motivated and capable Sixth Formers who are interested in more advanced studies in physics. This programme has also met with great success with a yearly enrolment up to 100 students. The "Astronomical Training Programme for Secondary School Students" is another enrichment programme offered by the Physics Department.

The Young Scholar Programme for Biology

The Biology and the EDB co-organised the "Young Scholar Programme for Biology (YSBP). The programme aims at providing summer learning opportunities for both teachers and

students, as well as bridging the gap between the tertiary and the secondary school sectors in biology education. More than 15,000 students and teachers from more than 160 schools have already attended the programme over the past seven years.

Furthermore, the Biology Department has recently received funding from the EDB to organise a summer course "Glimpses of the Oceans" for gifted students in 2008. Students will receive intensive training during a day-camp and several field trips to the seashore. The course is university-level credit-bearing and students who complete the course can earn university credits in advance.

Other Programmes and Courses

A number of courses have been offered by other constituent programmes of the Science Faculty. Among others are the "Chemistry Summer Camp for S6 Talents", "Workshops on Spectroscopic Identification of Organic Compounds", and "Lecture Series on Modern Chemistry" organised by the Chemistry Department. There are also a number of inter-disciplinary programmes that are organised by several departments and coordinated at the faculty level. The university-level credit-bearing course "Perspectives on Life" will take place from February to May 2008. The dilemma and various dimensions of the meaning of "life" will be explored from different perspectives, including biology, chemistry, physics, and religions. The course will provide training to 100 students gifted in science.

Intensive Training Programme for 4th International Junior Science Olympiad (IJSO)

In 2007, the Science Faculty was commissioned by the EDB to train 50 exceptionally-gifted students who were selected as candidates to represent Hong Kong (HK) to participate in the 4th International Junior Science Olympiad (IJSO) held in Taipei from 2 to 11 December 2007. This was the first time, after repeated invitations from the EDB, that CUHK took part in the training. The Departments of Biology, Chemistry, and Physics worked jointly to organise the 6-month intensive training programme that covered topics up to S6 level. The programme involved 160 contact hours including training in laboratories. Commencing in July 2007, the course was conducted in three phases. Based on their performance, students were selected to proceed to the next phase. Finally, six students were chosen to represent HK. The students performed extremely well in the Olympiad. They won one silver and five bronze medals for HK, the best record in the past years. It was worthy of note that out of the 50 students that were selected by the EDB from different gifted programmes to participate in the IJSO intensive training, 15 were selected from our S3-4 Enrichment Programme. Out of these 15 students, four of them were finally being selected as members of the 6-student HK team. This relatively higher proportion of our students being selected together with their excellent performance in IJSO present a clear evidence of success of our S3-4 Enrichment Programme.

(d) Applicant organisation's track records in QEF projects

Initiatives in the Science Faculty to promote quality science education have been supported by the QEF. Since its launch in 1998, QEF has funded a total of eight projects proposed by the Science Faculty and its constituent departments. Specifically, two faculty-level projects are premised on a strategic consortium of constituent departments of the Faculty to provide synergistic effect and to go beyond the disciplinary boundaries. The S3-4 Project was funded in the year 2005 and would be completed in August 2008.

Another faculty-level project "Case-based Learning of High School Science Subjects to Support Learning to Learn" was funded in the year 2003 (QEF Ref No. 2003/0597). The case-based project was completed in October 2006. The project aimed at promoting an innovative case-based teaching and learning pedagogy in science subjects. Its major deliverable consists of case-based teaching and learning materials in 13 science-related cases covering all six strands of the central science education curriculum laid down by the EDB. The

material presented for each case is comprehensive and user-friendly, and could be readily applied by students for self-learning or by school teachers to teach mathematics and science subjects. The case materials, with both Chinese and English versions, are suitable for students from level S3 to level S7. The materials have been widely disseminated and are easily accessible. A book in Chinese and another in English accompanying with a bilingual CD were produced. A total of 1800 books and 2250 CDs have been disseminated to the education community, including complimentary copies that were sent to every local secondary school. Copies of the books were also sold by QEF in the HK Book Fair held in the HK Convention and Exhibition Centre during 18 to 24 July 2007. All materials in the book together with other resources are available on the project website (<http://www.cuhk.edu.hk/sci/case-learning/>) that is accessible to the public. In effect, a host of case-based learning trial runs, seminars, workshops and exhibitions were delivered to the secondary school sector to promote this student-oriented approach during which many students and teachers were able to obtain first-hand experience in using the approach. The project has greatly benefited the entire education community, particularly in helping it build the momentum for the advancement of the case-based teaching approach. The success of the project is also evidenced by the fact that both the project and the approach have received good coverage in the press.

(e) The organisation's other favourable factors for implementing the project

The Science Faculty at CUHK is a community of scientists of wide range of expertise with inquiry-based, higher order thinking and creativity being their internalised norms. The Faculty can provide students with unique learning experience that can foster the development of multiple intelligences. In recent years, the Faculty has put in enormous effort in the design and implementation of innovative pedagogy approaches and has acquired much experience in that respect. The Centre for Promoting Science Education (CPSE) is a unit established under the Faculty. It undertakes the pivotal role of a central coordinator to consolidate effort as well as to provide support to internal and external parties. As the comprehensive list of our initiatives to promote science education to secondary schools is too extensive to be presented here, please refer to the CPSE website (<http://www.cuhk.edu.hk/cpse>), onto which information on previous and latest projects, and on-going activities in the Faculty have been uploaded.

3. Targets and expected number of beneficiaries

(a) 300 students as highly-involved direct beneficiaries

We propose to implement an enrichment programme that is similar to the one in the S3-4 Project. It will be divided into three phases that last for two academic years. A total of 300 students of level S3 will be selected to enter Phase 1 of the enrichment programme in the year 2008. Phase 1 of the programme seeks to arouse students' understanding of, interest in and appreciation of science by providing everyday-life scientific knowledge through lectures and various activities. After a series of assessments, about 40% of the students (some 120 students) will be invited to proceed to Phase 2, which will begin with an intensive training camp in the summer followed by a series of more specialised lectures in various science fields. The aim of Phase 2 is to enrich students' knowledge in a specialised area in which they have talent and are most interested. Students will attend one out of the four lecture series. About 40% of these students (some 50 students) can then proceed to the final Phase 3. Activities in Phase 3 are research-oriented and the objective is to develop students' capabilities and skills in conducting independent scientific research. The total number of direct student beneficiaries in the proposed enrichment programme will be 300.

(b) About 200 teachers as highly-engaged direct beneficiaries

Experience in operating the S3-4 Project suggested that teachers are most interested in interactive-mode development opportunities with small group discussion rather than lecture-type workshops with a large number of participants. In view of this, teachers will be invited to serve voluntarily as advisers, observers, students' mentors, or evaluators during the running of the programme, and a series of about 10 small-group teachers' workshops will be organised. As a result, the total number of such highly-engaged teacher beneficiaries is estimated to be 200.

(c) About 500 teachers, parents and students as direct beneficiaries

A symposium will be organised in 2010 when the students complete the research studies of the Phase 3. The students will then be invited to present their works in the symposium with the target audience being the school principals, teachers, parents, students and educators. The anticipated size of the audience is 500.

(d) Direct beneficiary sector – gifted education in science

At the moment, identification of students who are gifted in science relies heavily on teachers' nominations and different types of written tests. The development of specific instruments that can more effectively identify students who are exceptionally gifted in science is regarded as important and is an urgent need. One integral component of the presently proposed project is to develop valid and reliable instruments for identification of exceptionally gifted students at an early age. The objective is to identify students who possess higher order thinking, analytical mind, problem-solving skills, creativity, perseverance and other intellectual capabilities which are essential characteristics for a successful scientist. The proposed project team will design a set of instruments and will then make the instruments accessible to educators who have interests in gifted education for application. In other words, the project will produce deliverables that can benefit the entire sector of gifted education.

(e) Direct beneficiary units – schools that use student-oriented approach in science education

Although the education community calls for a change of pedagogy towards student-oriented and inquiry-based learning, there is a lack of relevant science teaching and learning resources that could support the initiatives. In view of this, a set of teaching and learning resources appropriate for use in secondary schools will be developed. The set of materials will be widely disseminated to all secondary schools to support the pedagogy promoted in the NSS reform. These resources will therefore benefit the entire secondary school sector.

4. Extent of teachers and principals' involvement in the project

Secondary school teachers and/or principals will be invited to participate in the project. At least 10 workshops will be organised for teachers. A symposium will be organised, which provides a platform for secondary school teachers, principals, and educators in the tertiary and other sectors to interact and share their experiences in conducting gifted education. Please also refer to paragraphs 3(b) and 3(c) above as well as 6(b) below for more details. Moreover, the project team will implement a very comprehensive evaluation plan in which collecting feedback from teachers and principals will be a major component.

5. Implementation plan with time-line

(a) A Summary of the Theoretical Framework for the Enrichment Programme

The framework for the S3-4 Enrichment Programme combined Bloom's Taxonomy and Gardner's multiple intelligences. It was detailed in the proposal for the S3-4 Project. Please refer to the summary of the S3-4 Project in Appendix 1. The same framework will continue to be applied in the enrichment programme in the proposed project. In essence, Bloom's taxonomy (Bloom, 1956; revised version: Anderson & Kwathwohl, 2001; Krathwohl, 2002) depicts that cognitive engagement levels range from simple memorisation to the creation and conceptualization of new ideas and products. Gardner and other authors suggested that students vary in their abilities across multiple intelligences and called for the provision of a wide-range of learning experiences for students with a view to developing them into efficient life-long learners with strong metacognitive skills (Gardner & Sternberg, 1994; Gardner, 1985, 1999). Premised on the framework, Phase 1 of the proposed enrichment programme aims at providing students with training in tackling genuine science problems where there is a focus on applying, analysing and evaluating the materials studied. Phase 2 of the Programme further enhances students' knowledge of science with a focus on developing their metacognitive skills. Phase 3 then trains up students to become independent and efficient learners through guiding and facilitating them to actually engage in authentic research problems.

(b) Areas to be Further Developed

The S3-4 Enrichment Project aimed at setting up a quality-assured model for developing gifted education. In order to achieve the objective the project team has developed the detailed curriculum design of the 3-phase programme. The design provides in details the content, the teaching materials used, the expected learning outcomes, the learning activities, the assessment schemes and the operational details. These curriculum designs can be used by secondary school teachers to organise similar programmes and activities. We have distributed to teachers who participated in the teachers' workshops not only the detailed curriculum designs but also the learning materials that have been distributed to students so as to present them with a full view. All students and teachers found those materials very useful and requested us to further develop and widely disseminate these materials. In response to these requests, a new major component of the proposed project is to further develop our teaching and learning materials in a comprehensive structure and systematic format that is appropriate for wider dissemination and application by teachers and students in the secondary school environment. Specifically, a set of instruments for the identification of exceptionally gifted students will first be developed. These instruments can also be used to assess a range of students' capabilities, such as creativity, ingenious, imaginative, and critical, analytical, logical or abstract thinking capabilities. Some of the instruments, supplementing with other materials, will be developed into a set of teaching and learning resources that can be readily used by teachers to conduct teaching and by students to undergo self-learning. The set of resources will be used in the proposed S3-4 programme and feedback will be collected from teachers and students. This will enable us to continually review and refine the materials before dissemination. Two versions of the materials, one for teachers and one for students, will be developed. Each version will be available in both Chinese and English as well as hard and soft copies.

Please refer to the next section for the proposed schedules of the activities to be carried out and the time-line.

6. Expected deliverables and outcomes

(a) Implementation of a 3-phase Enrichment Programme

A 3-phase enrichment programme in a structure similar to the S3-4 Enrichment Programme will be organised. This enables a group of 300 students directly benefited from the programme. Compared to the S3-4 Enrichment Programme, the numbers of beneficiaries in the second and third phases will be increased, and the content will be further enhanced based on feedback. A summary of the programme is given as follows.

Selection of participants

- Each school will be invited to nominate five S3 students to participate in the programme.
- Self-nomination will be invited through website and newspaper advertisements.
- A screening test that includes both multiple-choice items and open-ended questions will be administered.
- Some 300 students will be selected to join the Phase 1 activities. Preferences will be given to students who have never joined this programme before.

Phase 1: Science-related Workshops

- Some 300 students will participate in the Phase 1 activities.
- Duration of the workshops will be from February 2009 to April 2009.
- Six workshops will be held on alternate weekends, and students are required to attend at least 4 of them.
- Each workshop will last for 6 to 8 hours, making the total contact hours to be at least 24.
- The workshop will include lectures with a wide range of topics in science given by CUHK professors and instructors (all PhD level), and various activities such as visits, laboratory demonstrations and science-related games.
- Assessments will be conducted in each workshop. Students who perform best (top 40%, some 120 students) in the 4 workshops will be invited to join the Phase 2 activities.
- Students who have achieved the learning objectives of the first phase activities will be awarded a Certificate of Merit (the Bronze Certificate of Merit).

Phase 2: Summer Camp and Intensive Courses

- Some 120 students will participate in the Phase 2 activities.
- Duration will be from July 2009 to December 2009.
- Students are required to attend a summer camp of 3 days and 2 nights. Both science-related and social activities will be designed in the summer camp to enhance students' scientific ways of thinking and other generic capabilities.
- Students are also required to select 1 out of 4 science streams and attend a series of intensive courses.
- Various learning activities will be designed for the courses.
- Assessment will be conducted in each course. Students who perform best (top 40%, some 50 students) will be invited to join the Phase 3 activities.
- Students who have achieved the learning objectives of the second phase activities will be awarded a Certificate of Merit (the Silver Certificate of Merit).

Phase 3: Independent Research Studies

- Some 50 students will take part in the independent research studies.
- Duration of the research studies will be from February 2010 to May 2010.
- Students will be required to work on research projects of their choice in groups of 3 to 4 under the supervision of CUHK professors and teaching staff.
- Students who have achieved the learning objectives of the third phase activities will be awarded a Certificate of Merit (the Gold Certificate of Merit).
- A symposium will subsequently be organised and students will be asked to make an oral/poster presentation of their research studies.

(b) Teachers in-depth workshops

In parallel to students' learning activities, at least 10 workshops will be organised for teachers. The workshop will be interactive in nature. Teachers are offered opportunities to closely observe the activities such as the laboratory experiments that we designed for students. Draft teaching and learning materials will also be distributed to participating teachers for their personal reference. Small group in-depth experience sharing sessions will be held among university professors and secondary school teachers for sharing experiences on gifted education.

A symposium will be organised for students completing the phase 3 activities of research studies to present their works, during which there will be a component for teachers to exchange views and insights on gifted education.

(c) A set of instruments for identifying exceptionally-gifted students

Science taught at school level has its primary focus on the explanations of factual and conceptual material. As a result, instruments for assessing student and identifying gifted students rely heavily on written tests that usually place more emphasis on rote memorisation. However, science in the real world concerns analysing situations and applying concepts to work in previously unknown contexts, generating new ideas and establishing theories. In this project, valid and reliable instruments will be constructed to assess students' critical thinking capability and creativity in addition to their rote-learning ability. Specifically, the set of instruments will consist of at least 6 experiments, case studies, or other student-oriented learning activities in various science topics, ranging from biological, physical to mathematical sciences. Guidelines for assessing students' capabilities in various dimensions will be derived.

The set of instruments will be made available to units that are responsible and interested in gifted education, such as the gifted education section of CDI and teachers who participate in our workshops. The availability of such instruments will enable exceptionally gifted students be properly identified by using a more comprehensive approach. This strategy also lays the foundation for the development of further similar instruments.

(d) A set of teaching and learning materials

In addition, a set of teaching and learning materials will be produced to support the shift of pedagogy towards student-oriented learning. The set of materials will have two versions. One can be readily used by secondary school teachers to teach science topics, and the other can be used by students to pursue self-learning. The set of materials will cover at least 10 different topics and will be bilingual in both Chinese and English. The first batch consisting of at least 5 topics will be produced in an early stage of the project and another batch will be produced in a later stage.

The project team plans to publish a total of four books with accompanying CD based on the set of teaching and learning resources, two for teachers and two for students, two in English and two in Chinese. Although the books will be sent as complimentary copies to all secondary schools, the books to be produced will be in formats of high commercialization value. The books for students can also be adopted as a text or reference book. Samples of similar products are the books "Case-based Learning of High School Science Subjects to Support Learning to Learn" and "在科學科目上應用個案基礎學習法以促進學會學習" with accompanying CD that were produced by our Faculty of Science at CUHK with the support of QEF. In effect, copies of these books were sold by QEF in the HK Book Fair held in July 2007 at the printing cost of \$80 each.

(e) Proposed Schedules of the Activities to be Carried Out and Time-Line

	2008				2009												2010												2011	
Deliverables	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Preparation and Selection of student participants	■	■	■	■																										
Development of the set of identification instruments			■	■	■	■																								
Production of the set of identification instruments							■	■	■																					
Phase 1 scientific workshops						■	■	■																						
Teacher development workshops						■	■	■																						
Development of the 1 st batch of teaching & learning resources									■	■	■	■	■	■	■	■														
Production of the 1 st batch of teaching & learning resources																	■	■	■	■	■	■								
Phase 2 summer camp and intensive lectures											■	■	■	■	■	■														
Teacher development workshops													■	■	■	■														
Phase 3 research projects																		■	■	■	■									
Symposium																					■	■								
Development of the 2 nd batch of teaching & learning resources																		■	■	■	■									
Production of the 2 nd batch of teaching & learning resources																					■	■	■	■	■	■				
Production and printing of the electronic version of the teaching & learning resources																												■	■	■
Editing and printing of the books																												■	■	■

7. Budget with detailed breakdown

Half of the project costs will be sponsored by QEF and the remaining expenses will be supported by the Faculty of Science at CUHK and the income generated from the project, including admission fees and activity fees received from the participants. The project team is hereby seeking the support of HKD3.5 million from QEF, please refer to the following table for a summary and Appendix 2 for a more detailed breakdown on individual items.

Item	QEF Contribution(HK\$)
Staff Cost	
^a Project Coordinator	586,000 ^b
Sub-total	586,000
General Expenses	
Miscellaneous	113,000
Sub-total	113,000
Equipment	
Computer equipments	36,000
Others	4,000
Sub-total	40,000



Services	
Project Deliverables	1,465,000
Evaluation	180,000
Professional financial service	85,000
^c Conduction of Project activities	944,000
^d Part time IT Support	72,000
Others	15,000
Sub-total	2,761,000
TOTAL	3,500,000

Notes:

^a A project coordinator will liaise externally with students, external advisors, secondary school teachers, QEF, CDI and EDB, and will coordinate the teaching and learning activities that will be organized collaboratively by different units of the Science Faculty of the Chinese University of Hong Kong. S/he will also take a major role in the logistical arrangement of all teaching and learning activities. (Qualification: Bachelor degree).

^bInclude 5% MPF contribution.

^cThe 3-Phase activities include scientific workshops, summer camp, intensive training courses, research projects and teacher development workshops. In order to maintain a smooth and quality programme, it is necessary that the participants should pay partial tuition/activity fee, in which the total income generated from the participants will account for *about 25%* of the total cost for conducting the project activities, to ensure attendance and to cover part of the costs. Nevertheless, financial assistance is provided in the form of fee remission for participants who have financial needs. It is also expected that the project will have recruited 5 % students in receipt of the Comprehensive Social Security Assistance (CSSA) and full remission under the Student Financial Assistance Scheme (SFAS) and 10% students in receipt of half remission under the SFAS. According to the QEF application guide for the 11th round application, those students can have 100% and 75% support from the QEF respectively.

^dA part time IT Support will assist in website maintenance and design of the project promotional materials. S/he should possess extensive experiences and professional knowledge in web programming, graphic design and photography. S/he will be recruited on an hourly rate basis. (Qualification: Bachelor degree is preferable).

8. Evaluation parameters and methods

The S3-4 Enrichment Programme has been closely monitored and evaluated by CLEAR using a very holistic evaluation model. As the model has been using quite effectively, it will continue be used in the present proposed project. The details of the evaluation model are available in the proposal for the S3-4 Project and are summarized in Appendix 1, and they will not be related here. In essence, different approaches will be used to collect feedback for all activities from various sources. These approaches include both qualitative methods of focus-group and personal interviews as well as the quantitative method of questionnaire administration. Findings will be derived by analysing the feedback, and self-reflections at various levels will be conducted continually. Specific discipline-level self-reflection reports are basically compiled for internal use, and may include detailed analyses on feedback in relation to particular topics covered in a teaching and learning activity. These reports will be distributed to relevant units shortly after the completion of the activities to trigger timely improvement actions. Nevertheless, these internal self-reflection reports will also be readily available for

external monitoring. Moreover, an overall self-reflection of the entire programme will be conducted in an all-encompassing manner after the completion of each phase. Each overall self-reflection will include the summary statistics in the discipline-specific reports, and results derived from analysing various sources of feedback and discipline-specific findings. As the comprehensive reports will include teachers' experience and effective strategies for operating gifted programmes, they will be made available not only to the external monitoring agencies (e.g. QEF committees) but also to the public with a view to enhancing the development of similar programmes. Using the ongoing S3-4 Project as an indicator to show how much effort we will put in the aspect of self-evaluation in the proposed project, it is worthy of note that we have by far completed a total of 10 discipline-specific self-reflection reports for six workshops in Phase 1 and four intensive courses in Phase 2, as well as four overall self-reflection reports for the Phase 1 workshops, Phase 2 summer camp, and Phase 2 intensive courses.

9. Sustainability of the outcomes of the project

The S3-4 Project has successfully established a model for developing gifted programme for young students, equipping the education community with readily available curriculum designs, teaching materials, learning activities and assessment models. Feedback from teachers has confirmed that further development of teaching and learning resources will certainly enhance the sustainability of similar gifted programmes. We are confident that the project can benefit the entire education sector in four aspects:

- It further enhances the quality assured S3-4 Enrichment Programme and provides training to a group of talents to cater for their immediate needs during this transitional period of education reform.
- A set of instruments for the identification of exceptionally-gifted students will be developed. It lays the foundation for further development of similar instruments. Being able to properly identify the right youngsters to participate in gifted programmes is very important as otherwise the resources that the community puts in for gifted programmes can never be best utilised.
- An initial set of teaching and learning resources will be developed and widely disseminated. The set of resources are premised on directions that are highly emphasised in the NSS, such as "balance between theoretical and applied learning", "learning how to learn" and "inquiry-based learning" (EMB, 2005, p. 19). As concerted efforts have been made to promote continuous advancement along these directions, widest dissemination of the set of resources will facilitate adoption of student-oriented approach that in turn will ensure the long-term sustainability of the impact of the deliverables and the outcomes of the project.

10. Dissemination / publicity methods

In the S3-4 Project, project outcomes and deliverables are disseminated via teachers' workshops, website, and assistance from CDI. A large event will also be organised in May 2008 to disseminate the project results. These strategies will continue be used in the proposed project to disseminate the project outcomes and deliverables. Due to the success of the S3-4 project, we are confident that students and teachers are the most vital and effective vehicle to disseminate and publicise the project results of the previously held and the currently proposed project. In effect, the S3-4 Project has also successfully attracted high degree of publicity due to its students' outstanding performance, particularly in the IJSO. Moreover, the set of teaching and learning resources, which will be collected into books, will be of value to all science and mathematics teachers in the secondary school sector. Complimentary copies will be sent to every secondary school in HK to ensure widest dissemination and application of project deliverables, which will also increase publicity.



11. Other information

Science advances the society, and numerous government and business leaders around the world are articulating the significance of preparing, cultivating and equipping promising students to progress in science-related fields. While there are a number of enrichment programmes, not many programmes are specifically targeting at S3-level students gifted in science. Students, parents, teachers and educators who have attended activities of the S3-4 Project all provided very positive feedback and found the programme valuable to the community, especially during the current transitional period of education reform. The proposed project that is built on the success of the S3-4 Project will be able to meet an urgent need of the community.

We will implement an enrichment programme with a framework similar to the S3-4 Enrichment Programme. Some of the activities and specific components will be revised according to feedback collected from teachers and students to enhance the entire programme. A description on the new elements in the proposed project has been detailed in Section 5(b). In essence, the present project will build on the curriculum developed for the S3-4 Programme to design, develop and disseminate a set of instruments for the identification of exceptionally-gifted students and a set of teaching and learning resources that support the advancement of student-oriented pedagogy approach. The identification instruments will be disseminated to those units and teachers who are responsible for or interested in gifted education in science. The teaching and learning resources, which will be bilingual and have versions respectively for teachers and students, will be disseminated to every secondary school.

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The Development of Student-Oriented Teaching and Learning Resources in Science and a Science Enrichment Programme for Secondary 3-4 Students
Detailed budget breakdown supported by the Quality Education Fund (Appendix 2)

Item	Unit	No. of Unit	Unit Cost (HK\$)	No. of Time/Pieces	Amount Unit	Sub-item Cost (HK\$)	Total Cost supported by QEF (HK\$)	Item Description / Remarks
Staff Cost								
Administration								
¹ Project Coordinator	person	1	18600	30	month	585,900		
Total in this category						585,900		
round-up to thousand						586,000		
Sub-total						586,000	586,000	
General Expenses								
Miscellaneous								
Promotion								
Posters and leaflets	set	2	5	500	school	5,000		promotions for preliminary and intermediate stage
News advertisement	ad.	1	6000	8	issue	48,000		promotions for the project, including screening test.
General Administration	lumsun	1	1000	30	month	30,000		printing cost and postage
Stationery	lumsun	1	1000	30	month	30,000		letter set and plain paper etc.
Total in this category						113,000		
Sub-total						113,000	113,000	
Equipment								
Computer equipments								
Hardware								
Desktop standard set	set	1	6000	1	project	6,000		For general administration
Notebook set	set	1	9000	1	project	9,000		For teaching
Printer	set	1	1000	1	project	1,000		For general administration
² Software	set	2	10000	1	project	20,000		For 1 desktop set and 1 notebook set, softwares include design & web and office utility packages licenses and media.
Total in this category						36,000		
Others								
Reference books	lumsun	1	4000	1	project	4,000		For teaching reference
Total in this category						4,000		
Sub-total						40,000	40,000	
Services								
Project Deliverables								
Development								
Identification instruments	hour	150	1000	2	set	300,000		Chinese and English versions
Teacher resources	hour	150	1000	2	set	300,000		Chinese and English versions
Student resources	hour	150	1000	2	set	300,000		Chinese and English versions
Production								
Video Design	hour	130	300	6	set	234,000		Chinese and English versions of identification instruments, teacher and student resources
Video editing	hour	50	300	1	set	15,000		Chinese and English versions of identification instruments, teacher and student resources

Editing and translation	hour	50	300	6	set	90,000	Chinese and English versions of identification instruments, teacher and student resources
Dissemination							
Printing cost							
Student & Teacher resources	copy	1000	30	4	set	120,000	Chinese and English versions
Identification instruments	copy	100	30	2	set	6,000	Chinese and English versions
CD production cost	copy	1000	20	2	set	40,000	Chinese and English versions
Distribution	copy	1000	15	4	set	60,000	Chinese and English versions of teacher and student resources
Total in this category						1,465,000	
Evaluation							
Development of evaluation instruments	hour	30	1000	2	set	60,000	1 for teacher-evaluation and 1 for student-evaluation
Focus groups and interviews	hour	2	1000	20	meeting	40,000	10 student-meetings and 10 teacher-meetings
Production of reports	hour	4	800	10	set	32,000	Chinese and English versions of ~ 5 reports for the whole project
Editing and translation	hour	4	300	10	set	12,000	Chinese and English versions of ~ 5 reports for the whole project
Production of resource books chapters	hour	8	1000	4	set	32,000	Compiling 1 Chinese and 1 English version of 1 chapter in both teacher and student resource books
Professional consultation	person	1	800	5	meeting	4,000	Professor rank
Total in this category						180,000	
Professional financial service							
Professional accounting service	person	1	2500	30	month	75,000	Provide service and compiling reports
³ Audit fee	lumpsum	1	10000	1	project	10,000	
Total in this category						85,000	
Conduction of Project activities							
Course Materials							
Screening Test	person	1000	10	1	test	10,000	
Phase 1 - Scientific Workshop	person	300	100	6	workshop	180,000	
Phase 2 - Summer Study Camp	person	120	1250	1	activity	150,000	
Phase 3 - Intensive Course	person	120	1250	1	activity	150,000	
Phase 3 - Scientific Research Project	person	50	1000	1	project	50,000	
Teacher Development Workshop	person	20	50	10	workshop	10,000	
Symposium	person	500	50	1	activity	25,000	
⁴ Venues and facilities							
Phase 1 - Scientific Workshop							
Lecture Theatre (LT) >300p	room	1	1960	6	workshop	11,760	
Laboratory (Lab) >60p	room	2	1860	6	workshop	22,320	
Use of apparatus/fixtures	set	1	70	300	person	21,000	
Phase 2 - Summer Study Camp (3 days 2 nights)							
Accommodation	person	135	150	2	night	40,500	
Workshop venues (Lab/	room	1	1960	5	workshop	9,800	
Use of apparatus/fixtures	set	1	70	120	person	8,400	
Phase 2 - Intensive Course							
Lecture Theatre <50	room	4	350	32	lesson	44,800	
Laboratory <60	room	4	620	16	lesson	39,680	
Use of apparatus/fixtures	set	1	70	120	person	8,400	
Phase 3 - Research Project							
Laboratory/ classroom <60	room	1	620	130	meeting	80,600	There are 13 projects, 10 meetings each
Use of apparatus/fixtures	set	1	70	50	person	3,500	
Teacher Development Workshop							
Seminar Room >50	room	1	510	10	workshop	5,100	
Symposium							

Lecture hall	hall	1	10000	1	day	10,000		The capacity of the hall should be 500 audience or above
Exhibition hall	hall	1	2500	2	day	5,000		One day for set up and another for the event
Part time instructors and assistants								
Screening Test								
Helpers	person	4	150	2	session	1,200		1 session lasts for about 3 hours
Phase 1 - Scientific Workshops								
Instructor (Instructor/Professor rank)	person	1	6000	6	workshop	36,000		1 workshop lasts for about 6-8 hours and includes about 4 hours preparation time
Helpers	person	30	300	6	workshop	54,000		
Technician / Lab Assistant	person	4	1200	6	workshop	28,800		
Phase 2 - Summer Study Camp								
Instructor (Instructor/Professor rank)	person	1	3000	5	workshop	15,000		1 workshop lasts for about 3-4 hours and includes about 2 hours preparation time
Helpers	person	15	1000	1	camp	15,000		helpers should stay for 3 days and 2 nights
Technician / Lab Assistant	person	2	600	5	workshop	6,000		
Phase 2 - Intensive Course								4 courses will be provided
Instructor (Instructor/Professor rank)	person	4	3000	8	lesson	96,000		1 lesson lasts for about 3-4 hours and includes about 2 hours preparation time
Helpers	person	4	150	8	lesson	4,800		
Technician / Lab Assistant	person	4	600	4	lesson	9,600		
Phase 3 - Research Projects								
Instructor (Instructor/Professor rank)	person	1	30000	13	project	390,000		1 project has about 10 meetings, each meeting lasts for about 3-4 hours and includes about 2 hours preparation time
Helpers	person	1	1500	13	project	19,500		
Technician / Lab Assistant	person	1	6000	13	project	78,000		
Teacher Development Workshops								
Instructor (Instructor/Professor rank)	person	1	2000	10	workshop	20,000		1 workshop lasts for about 2-3 hours and includes about 2 hours preparation time
Helpers	person	2	100	10	workshop	2,000		
Symposium								
Instructor (Instructor/Professor rank)	person	2	6000	1	activity	12,000		The symposium lasts for about 6-8 hours and includes about 4 hours preparation
Helpers	person	10	300	1	activity	3,000		
Miscellaneous								
Insurance	package	1	9000	1	project	9,000		
Videos/ Photos taking	package	1	2500	6	activity	15,000		Activities include 3 phase programme, teacher workshop and a symposium
Transportation	package	1	3000	5	activity	15,000		Activities include screening test, 3 phase programme and a symposium
Total in this category						1,715,760		
⁵ QEF funding support to programme students						943,668		100% students of 300 students will receive 50% QEF sponsor; and 10% students will receive additional 25% QEF sponsor and 5% students will receive additional 50% QEF sponsor
round-up to thousand						944,000		
Part-time Support								
⁶ Technician (part time)	hour	8	300	30	month	72,000		
Total in this category						72,000		
Others								
Contract-out services	lumsun	1	15000	1	project	15,000		e.g. visits and fieldtrips fee; equipment borrowing fee
Total in this category						15,000		
Sub-total						2,761,000	2,761,000	

Appendix 1

TOTAL							3,500,000	
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- Notes:
1. A project coordinator will liaise externally with students, external advisors, secondary school teachers, QEF, CDI and EDB, and will coordinate the teaching and learning activities that will be organized collaboratively by different units of the Science Faculty of the Chinese University of Hong Kong. S/he will also take a major role in the logistical arrangement of all teaching and learning activities. (Qualification: Bachelor degree). Budget already includes 5% MPF contribution.
 2. Pricing with reference to CUHK ITSC pricing standard.
 3. According to 'Quality Education Fund 11th round Application Form Guide to Applicants' No. 13, For a project of over \$3 million grant, the grantee should submit, upon completion of the project, an external auditor's report the expenses of which could be included in the budget.
 4. According to University guideline, 1 laboratory/ lecture theatre costs ~\$1860-1960/ day.
 5. According to 'Quality Education Fund 11th round Application Form Guide to Applicants' No. 24, the QEF sponsors half of the costs of students' activities including camps, study trips, leadership training programmes, etc. and provides additional funding support for socio-economically disadvantaged students enrolled in such activities. Students in receipt of the Comprehensive Social Security Assistance (CSSA) and full remission under the Student Financial Assistance Scheme (SFAS) can have 100% support from the QEF while those in receipt of half remission under the SFAS can get 75%. The funding should be equal to :Total cost for student learning activity x (0.5 + 0.5 x % CSSA / SFAS Full Remission+ 0.25 x % SFAS Half Remission)
 6. A part time IT Support will assist in website maintenance and design of the project promotional materials. S/he should possess extensive experiences and professional knowledge in web programming, graphic design and photography. S/he will be recruited on an hourly rate basis. (Qualification: Bachelor degree is preferable).

- Remarks:
1. In order to maintain a smooth and quality programme, it is necessary that the participants should pay partial tuition/activity fee, in which the total income generated from the participants will account for about 25% of the total cost for conducting the project activities (=\$1,715,760x0.25=\$428,940), to ensure attendance and to cover part of the costs.