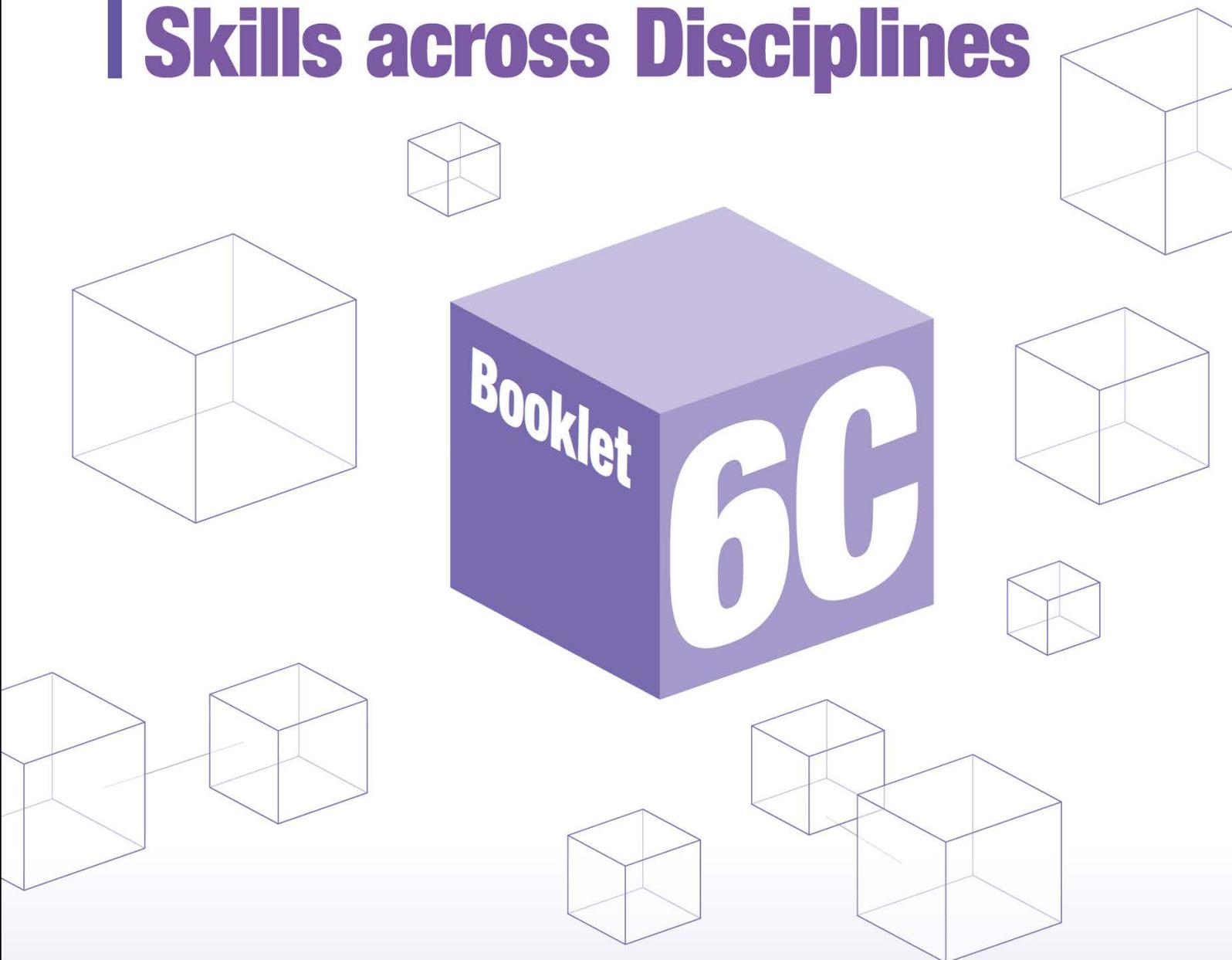


Project Learning: Towards Integrating and Applying Knowledge and Skills across Disciplines



Booklet 6C Project Learning: Towards Integrating and Applying Knowledge and Skills across Disciplines

This is Part C of Booklet 6, one of the 11 Booklets in the *Secondary Education Curriculum Guide*. Its contents are as follows:

Contents of Booklet 6C

6C.1	Background	2
6C.2	Purposes of the Booklet	2
6C.3	Project Learning as a Strategy to Promote Student Learning.....	3
6C.3.1	<i>Essential Qualities of Project Learning</i>	3
6C.3.2	<i>Project Learning and Learning and Teaching of Subject Knowledge</i>	3
6C.3.3	<i>Developing Students' Generic Skills in Project Learning</i>	4
6C.4	Planning of Project Learning in the Whole-school Curriculum	5
6C.4.1	<i>Guiding Principles for Planning Project Learning</i>	5
6C.4.2	<i>Facilitating Factors for Project Learning</i>	7
6C.4.3	<i>Different Levels of Enquiry and Teachers' Roles at Each Level of Enquiry</i>	9
6C.5	Project Learning in Practice	10
6C.5.1	<i>Three Stages of Project Learning</i>	10
6C.5.2	<i>Assessment in Project Learning</i>	11
6C.5.3	<i>Frequently Asked Questions</i>	12
6C.5.4	<i>School Example</i>	13
6C.6	Support Available to Schools	16
Appendix	17
Bibliography	21

6C.1 Background

- As one of the Four Key Tasks, Project Learning (PL) has been implemented since 2001 at the primary and secondary levels as an effective strategy in fostering students' learning to learn and lifelong learning capabilities.
- With schools' active promotion, PL has been prevalent in many subjects of the secondary school curriculum. A repertoire of strategies has been adopted in its implementation, and PL is often integrated with other Key Tasks or Key Learning Areas (KLAs)/subjects to broaden the scope of student learning.
- Building on prior valuable experiences on implementing PL, it is envisaged that PL will continue to play an important role in promoting students' learning to learn capabilities for self-directed and lifelong learning so that students could face the challenges ahead in their studies and future careers.
- In view of the proliferation of digital tools and resources in the 21st century, PL can facilitate the implementation of the Major Renewed Emphases (MRE) for the ongoing renewal of the school curriculum. PL could provide opportunities for students to integrate and apply knowledge and skills from different disciplines and nurture their creativity and innovativeness in the context of MRE such as promoting STEM education and Language across the curriculum (LaC).

6C.2 Purposes of the Booklet

- To review the current development of PL
- To highlight the planning and effective strategies for implementing PL at the secondary level
- To make recommendations for the way forward

6C.3 Project Learning as a Strategy to Promote Student Learning

6C.3.1 Essential Qualities of Project Learning

- PL, which is enquiry in nature, is a powerful learning strategy to promote self-directed, active and self-reflective learning. It can be contextualised within and across KLAs and beyond.
- PL usually starts with an enquiry question or a problem, and involves students in working together or individually to plan, read, gather information and make conclusions and/or recommendations over a period of time. Emphasis should be placed on both the learning process and the product which are equally important.
- PL activities often involve the other three Key Tasks, particularly Reading to Learn: Towards Reading across the Curriculum and Information Technology (IT) for Interactive Learning: Towards Self-directed Learning. Through engaging in various activities for acquiring new information and skills, students practise self-directed learning in order to learn more about the topic and at the same time explore and develop moral and civic values and positive attitudes.
- Bridging student learning at various interfaces is a key consideration in the design of PL. Building upon students' prior experiences at the primary level, PL at the junior secondary (JS) level prepares students for further enquiry studies at the senior secondary (SS) level, e.g. in preparing students for the Independent Enquiry Study (IES) in Liberal Studies.

6C.3.2 Project Learning and Learning and Teaching of Subject Knowledge

- PL is complementary to the learning and teaching of subject knowledge. It provides alternative learning experiences to engage students in the learning process.

- PL is different from a subject-based curriculum. It is open and always conducted in the context of KLAs, and the stages of development may not follow a fixed sequence. To ensure that students can benefit from rich and authentic experiences, schools have to consider their own contexts and design PL in accordance with students' learning abilities and interests.

6C.3.3 *Developing Students' Generic Skills in Project Learning*

- PL is a good vehicle for fostering students' development of all the nine generic skills, i.e. collaboration skills, communication skills, creativity, critical thinking skills, information technology skills, mathematical skills, problem solving skills, self-learning skills and self-management skills.
- The nine generic skills can be broadly represented in three categories and are related to PL as follows:

Category	Description
Basic skills <i>(Mathematical Skills, Information Technology Skills and Communication Skills)</i>	<ul style="list-style-type: none"> • Students are required to acquire, organise, and present information in verbal, numerical and graphic modes.
Personal and social skills <i>(Collaboration Skills, Self- management Skills and Self-learning Skills)</i>	<ul style="list-style-type: none"> • Students are required to plan and manage their work systematically.
Thinking skills <i>(Creativity, Critical Thinking Skills and Problem Solving Skills)</i>	<ul style="list-style-type: none"> • Students are required to investigate a question or a problem from different perspectives and explore different approaches to tackle it.

- In conducting any project, students need to command a variety of generic skills. When planning for PL across different levels, schools can assign a cluster of skills to each level as the focus for learning and assessment. More support can be given to developing these focused skills as students conduct the project. By engaging in projects year after year, students will gradually build up and strengthen their repertoire of integrative application of generic skills.
- Group projects serve as a good platform for the building up of collaborative problem solving skills. To work successfully in groups, students need to learn how to work with others and do things they might not need to care about when they work independently, e.g. to break down the task into steps and distribute workload, not to be too forceful on their own opinions, to take on and improve other people's point of view.
- Students also need to know how to handle issues that only arise in group work, e.g. to exchange their ideas with others and to co-ordinate efforts and contribution of different group members (*please refer to Appendix 1 of Booklet 2 for detailed description and application of the generic skills*).
- At the JS level, students could continue to strengthen these skills through PL within and across different KLAs. Schools could also provide opportunities for students to further develop IT skills, problem solving skills and self-learning skills.
- At the SS level, students should be entrusted with a higher degree of freedom and a wider range of choices for the topic of PL. There should also be opportunities for students to learn to plan and manage their own learning to facilitate deep learning.

6C.4 Planning of Project Learning in the Whole-school Curriculum

6C.4.1 Guiding Principles for Planning Project Learning

- The planning of PL should be in line with the school contexts including the school background, the school development plan, the school curriculum, the abilities and interests of students, and the availability of resources.

- The objectives of PL should be clear and specific. The expected learning outcomes should also be made explicit to students.
- For interdisciplinary themes and focuses, such as those relating to STEM education, and moral, national, civic and values education, collaboration among KLAs and school functional teams is strongly recommended so as to help students connect different learning experiences, and integrate and apply knowledge and skills across disciplines.
- PL should be built on students' prior learning experiences and achievements. Schools could gather relevant information from students and devise a vertical skill development framework of different levels to facilitate and scaffold students' development of generic skills in a progressive manner.
- The variety of learning activities in PL could also be arranged suitably at different times of the school year, the design of learning activities in PL should be appropriate to the age, interests, level and ability of students, and in alignment with the school curriculum. If the project work is too demanding and difficult, students' interests will be reduced and their learning motivation and effectiveness will be hampered.
- Various stakeholders such as parents and different sectors of the community could be involved in the promotion of PL to provide more resource support for students.
- As the learning process is as important as the final product in PL, diversified reporting modes and assessment strategies should be developed to assess students, inform learning and teaching, and cater for learner diversity.

Reflective Question

- ✧ What is the design of PL in your school? How can PL enhance students' learning?

6C.4.2 Facilitating Factors for Project Learning

- Whole-school planning and overall co-ordination are important for fostering PL across KLAs. Collaboration and co-ordination could also minimise overlapping and wastage of resources, and help relieve the pressure on students and teachers.
- There should be a consensual understanding of the objectives, processes and benefits of PL among different stakeholders, who should also be guided to develop a positive attitude towards PL.
- Support should be made available from the school administration such as professional development opportunities, in which teachers learn how to guide and supervise students to plan and design a meaningful topic in alignment with the school curriculum and of an appropriate scope and level of difficulty and complexity.
- The school management should perform a co-ordinating role to help teachers of different KLAs/subjects to sequence their project assignments to avoid overloading students with too many projects within the same period. There could be prior timetabling arrangements on the school calendar and flexible use of lesson time such as holding a Project Learning Week once or twice a year and reserving a common timeslot on the timetable for students of the same year level to engage in relevant activities and presentation for PL.
- The creation of a self-directed learning atmosphere is conducive to the promotion of PL. As the experience in PL accumulates, students would master the skills of open enquiry at the SS level and develop the skills and habits of a self-directed learner (*please refer to Section 6C.4.3 and Appendix of this booklet for more details*).
- As students' experience in PL accumulates, students can be entrusted with more responsibilities for their own project assignment, such as deciding on the research topic, the mode of enquiry and the format of presentation according to their interests and readiness. This will enhance their sense of ownership and provide incentives for self-directed learning. Throughout the process, teachers should play the role of a facilitator and provide guidance and support.

- Capitalising on technological advancement, schools could provide more opportunities for students to conduct PL with the use of IT so as to cater for different learning styles and foster self-directed learning capabilities. In the process of PL, IT is instrumental in strengthening students' computational thinking skills (*please refer to Booklet 6D or visit the EDB website at: http://cd1.edb.hkedcity.net/cd/projectlearning/index_e.html for more details*).
- Schools should make arrangements for regular cross-KLA/subject projects (e.g. once a year) for students to connect their learning experiences from different areas of study. Creative insights would occur when students can make connections between ideas and experiences that were previously disconnected.
- It is not necessary to require students to exhibit uniform learning outcomes, i.e. students can draw up different findings and reach different conclusions for their studies as long as the arguments are logical and supported by sufficient data/evidence.
- Students should be taught to fully utilise support from various sources, including community resources, in conducting their studies in order to acquire a comprehensive and balanced understanding of the topic for further analysis and evaluation. In using reference materials, both teachers and students should consider factors such as availability, affordability, authenticity, reliability, appropriateness and copyright.
- Community resources such as museums, libraries, government departments, public institutions and non-governmental organisations (NGOs) could be fully utilised to provide students with more life-wide learning opportunities (*please refer to Booklet 7 for more details*).
- Parents' facilitation and support are conducive to the smooth implementation of PL. Schools should explain to parents the purpose of PL so that they can play a supportive role in it.

Reflective Questions

- ✧ How do teachers in your school ensure that students' prior learning experiences are well tapped in PL?
- ✧ What is the role played by the parents of your students in PL?
- ✧ How are students in your school reminded to access information ethically, legally, and responsibly in PL?

6C.4.3 Different Levels of Enquiry and Teachers' Roles at Each Level of Enquiry

- Enquiry is an active learning process in PL. Students need to identify a topic, set an enquiry question, conduct investigation, collect and analyse information, and draw their conclusion after critical thinking. Most students need substantial scaffolding before they are ready to develop the enquiry questions and design effective data collection procedures to answer the questions set.
- There are many different explanations and levels for enquiry instruction. Enquiry activities can range from highly teacher-directed to highly student-initiated. The degree of complexity in an enquiry activity varies depending on the level of openness and the cognitive demands required. There are significant changes in teachers' role at different levels of enquiry. The Appendix provides details on the different levels of enquiry and teachers' roles at each of these levels.

6C.5 Project Learning in Practice

6C.5.1 Three Stages of Project Learning

- There are three stages in conducting PL: (1) Preparation Stage; (2) Implementation Stage; and (3) Concluding Stage. Students may develop their enquiry habits of mind and self-directed learning capabilities throughout the process.

(1) Preparation Stage (for idea initiation)

- Teachers set clear learning aims and objectives with students so as to develop a sense of ownership of the project.
- Teachers arrange various activities such as expert talks, discussions on a hot issue and site visits with a mind to arousing students' concern and enhancing their understanding of a topic.
- Teachers encourage students to participate in discussions actively and guide them to formulate researchable, challenging and meaningful questions.

(2) Implementation Stage (for enquiry process)

- Students collect various types of necessary information to build up their knowledge of the topic.
- Teachers help students develop the skills of information processing, including the collection, review and selection of information. Ethical use of information is also stressed. Students are aware of copyright issues, avoid plagiarism as well as keep a proper record of the information they have collected.

(3) Concluding Stage (for knowledge building)

- Students reflect on the whole project and come to a conclusion based on evidence and reasonable judgement with constructive and feasible recommendations.
- Finally, students present, share and reflect on the outcomes of the project in various ways.

- Teachers are both facilitators and learning partners throughout the three stages of PL. With appropriate facilitation, students are guided to formulate a meaningful and worthwhile topic of appropriate scope as well as to draw up a feasible plan with milestones and time frame. Where necessary, teachers would provide continuous guidance, support and timely feedback to students during the process.

6C.5.2 Assessment in Project Learning

- Assessment in PL can serve three distinct but interrelated purposes: assessment for learning (AfL), assessment as learning (AaL) and assessment of learning (AoL). By emphasising AaL, teachers will help students reflect on their own progress of learning so as to make improvement and plan for the next stage of learning (*please refer to Section 4.3.2 of Booklet 4 for more information on AfL, AaL and AoL*).
- As both the process and products of PL are equally important, schools should keep track of students' progress and performance through conducting ongoing assessment and providing timely, quality and pertinent feedback rather than just giving a grade or mark on the final product.
- Assessment is not confined to the realm of knowledge. It should cover the skills acquired and the values and attitudes of the students in the process of conducting the project.
- Teachers should inform students of the assessment rubrics and explain to them clearly before they start conducting the project. Students could then understand what is expected of at each performance level. The use of assessment rubrics will help teachers indicate the strengths and weaknesses of students' performance in PL and give constructive feedback. Students could also refer to the rubrics to review their learning process and performance in PL.
- Teachers could incorporate peer assessment and self-assessment as an integral part of PL so as to gain a comprehensive understanding of students' progress and performance in PL. Based on assessment rubrics which explicitly define different levels of performance, teachers could clearly explain to students the assessment criteria and the expected learning outcomes. Students could then refer to the assessment rubrics and exemplars for self-assessment or peer assessment for informing and

improving their own learning.

6C.5.3 Frequently Asked Questions

Below are some queries about the right or best approach for PL. Related responses are provided for reference.

- ***Should schools adopt the mode of interdisciplinary PL?***

There is no one-size fits all or “one best” mode of PL. As each school has its unique school context, including its organisation of the JS and SS curriculum, experience in conducting PL, self-directed learning atmosphere, deployment of resources etc., schools should therefore be flexible in adopting different modes of PL such as interdisciplinary or subject-based PL to help students develop the learning to learn capabilities.

- ***Should PL adopt an open-enquiry approach?***

PL is an opportunity for students to learn to plan and manage their own learning. Yet, secondary students cannot be expected to begin there without any preparation. The enquiry journey should be seen as a continuum. Teenage students may need support and guidance during the process of conducting a project. Teachers could act as facilitators and learning partners to maximise student learning. Throughout the entire enquiry process, teachers may vary the degree of support and guidance with respect to the needs and abilities of students and their pace of learning. Students may make progress through practice, and gradually build the capacity to handle a more open and complex enquiry.

- ***Is first-hand data preferred in PL?***

First-hand and second-hand data are complementary to each other. Both of them, as long as they are reliable, are valuable evidence to support an investigation. Due regard should be paid to students’ workload and ability. It is also important that students are able to use data from different sources for a balanced view of the topic under investigation so as to develop multiple perspectives and critical thinking skills.

- ***Should PL aim at developing students’ generic skills only?***

PL aims at developing students’ generic skills and self-directed learning capabilities. In the enquiry process, students acquire knowledge and some may construct new knowledge of the topic under investigation.

Therefore, PL can facilitate students' knowledge acquisition and development of generic skills, and at the same time cultivate positive values and attitudes.

6C.5.4 School Example

- PL can be introduced as a learning, teaching and assessment mode at any level from primary to secondary. Some schools have already made PL part of their school curriculum.
- Collaboration among different subject teachers is essential to facilitate the effectiveness of PL. Projects may range from small-scale projects to a large-scale annual project and take up a certain amount of lesson time.
- A school example is shown below to demonstrate how PL can be implemented across different KLAs.

Example: Developing Students' Ability to Integrate and Apply Knowledge and Skills from Different KLAs through Project Learning

Project Topic: Designing a diet menu for a healthy school lunch box

Student Level: Secondary 1-3

Aims:

- To raise students' awareness of healthy eating
- To develop students' ability to integrate and apply knowledge and skills across the Science, Technology and Mathematics Education KLAs
- To develop students' creativity, collaboration skills, problem solving skills and enhance their information literacy

Curriculum: Science Education, Technology Education & Mathematics Education KLAs

KLA	Learning Elements
Science Education	<ul style="list-style-type: none">• Common food substance• Function of food substance• Food pyramids• Balanced diet• Healthy lifestyles
Technology Education	<ul style="list-style-type: none">• Dietary goals and eating habits• Principles and skills in food preparation• Use of computer networks
Mathematics Education	<ul style="list-style-type: none">• Computing and interpreting data• Diagrams and graphs

Background:

- In a secondary school, most of the S1-3 students order lunch boxes from a supplier chosen by the school through a quotation exercise. Both students and the school are concerned about the quality of lunch boxes from the supplier. On one hand, students are concerned about the taste, quality and quantity of the food. On the other hand, the school is more concerned about the nutritional values of the food which is so important to the health of their teenage students.
- The Junior Form (S1-3) teachers work collaboratively and ask students to conduct a group project on designing a diet menu for a healthy lunch box in order to help students understand what kind of healthy and quality food they should have for lunch at school.
- The teacher adopts a cross-disciplinary approach and the learning elements from the Science, Technology and Mathematics Education KLAs are drawn. Students have to integrate and apply the knowledge and skills from the three KLAs in the process of conducting the project.

Procedures:

Preparation Stage

- Teachers briefed the students on the background and topic of the project. A video on healthy eating for teenagers is played to arouse students' interest in the topic and help them understand the purpose of conducting the project.
- Teachers of the three KLAs introduce/revise related learning elements during their lessons.
- Working in groups of four, students formulate their enquiry questions. They also discuss in groups and plan how to distribute the workload and conduct the project.

Implementation Stage

- Students collect the necessary information to build up their knowledge of the topic:
 - Some groups apply their IT skills to search for information from the Internet about food and diet, including the functions of various food substances, different nutritional values, recommended daily intake, etc.
 - Some groups apply their computational skills to calculate and analyse the nutritional values of different types of food.
 - One group even conducts a survey to collect information about the food preference of their fellow students, and prepare food samples for tasting.
- Each group discusses and designs their diet menu. Students also have to explain the choice of food in their diet menu based on the information collected. With their teachers' guidance, students learn how to acknowledge the source of information.

Concluding Stage

- After proper analysis, each group prepares the healthy diet menu. A presentation is made to the school lunch box supplier via arrangements made by their teachers. They explain the choice of food for a healthy school lunch box. They also raise questions, share their views and comment on other groups' products.

6C.6 Support Available to Schools

To promote PL at the secondary level, the EDB has provided a wide range of learning and teaching resources.

- Independent Enquiry Study (IES) of the SS Liberal Studies Curriculum

To support schools and teachers in the implementation of Independent Enquiry Study (IES), the Liberal Studies Section of the Curriculum Development Institute, the EDB has provided learning and teaching materials of IES such as experience sharing articles, online courses, videos, professional development programmes materials, etc. Concerning the assessment criteria of IES, teachers can make reference to the School-based Assessment Teacher's Handbook published by the Hong Kong Examinations and Assessment Authority.

The website for “Liberal Studies Web-based Resource Platform – IES Zone (Chinese Only)” is available at:

<http://ls.edb.hkedcity.net/en/index.php>

- PL in gifted education

To promote PL in gifted education, the Gifted Education Section of the Curriculum Development Institute, the EDB has provided a wide range of learning and teaching resources, e.g. the teaching design and exemplars of PL in different KLAs.

The website for “The teaching design and exemplars of the key learning areas – PL” is available at:

http://www.edb.gov.hk/en/curriculum-development/major-level-of-edu/gifted/resources_and_support/l_and_t/index.html



Levels of Enquiry¹

- A four-level model of enquiry instruction called “Herron Scale” was developed by Herron (1971) to illustrate how enquiry-based activities can range from highly teacher-directed to highly student-initiated, based on the amount of information or instruction given to students.

The Herron Scale

<u>Level</u>	<u>Problem/Question</u>	<u>Procedure</u>	<u>Solution</u>
0	Given	Given	Given
1	Given	Given	?
2	Given	?	?
3	?	?	?

(Adapted from Schwab, 1962; Herron, 1971)

- Banchi and Bell (2008) outlined four levels of inquiry and the progression can be a reference for teachers on how to scaffold inquiry learning skills for students from the JS level to the SS level.

¹ The words "enquiry" (commonly used in British English) and "inquiry" (commonly used in American English) can be used interchangeably to mean the attempt to discover the facts about something. In this Appendix, the use of "enquiry" or "inquiry" is according to the academics' original work.

- The four levels of inquiry are illustrated in the table below:

Level of Inquiry	Description	Question	Procedure	Solution
1	<i>Confirmation Inquiry</i> Students confirm a previously introduced idea through an activity in which the results are known in advance. They follow the directions for the investigation, record their data and analyse the results.	✓	✓	✓
2	<i>Structured Inquiry</i> Students investigate a question provided by the teacher through a prescribed procedure. They generate an explanation through evaluating and analysing the data collected.	✓	✓	
3	<i>Guided Inquiry</i> Students investigate a question provided by the teacher. They design the investigation procedures and the resulting explanations.	✓		
4	<i>Open Inquiry</i> Students investigate a question derived by themselves. They design how to conduct the investigation and communicate their findings and results.			

- The inquiry scale should be seen as a continuum. Students should have developed the skills and knowledge at Inquiry Levels 1 to 3 before conducting Inquiry Level 4. A gradual progression to the higher Inquiry Levels will result in greater student involvement and satisfaction. Students progressively take more responsibility for the content, processes and outcomes of their learning and will become increasingly independent students.

Teachers' Roles at Different Levels of Inquiry (Banchi and Bell)

There are significant changes in teachers' roles at different levels of inquiry outlined by Banchi and Bell (2008).

- ***Confirmation Inquiry (Level 1)***

Teachers have to choose a topic which is familiar and interesting to students and explain that the purpose of inquiry is to confirm the known results through engaging in an investigation themselves. Background information has to be provided to help students connect their learning experiences. Students' involvement in the investigation has to be explained clearly in order to introduce the investigation procedures or help students practise specific inquiry skills such as collecting and recording data. This kind of inquiry is important as it gradually develop students' abilities to conduct higher levels of inquiries.

- ***Structured Inquiry (Level 2)***

Teachers are responsible for developing a series of carefully structured activities and all necessary materials to stimulate students' interest in and sharing of ideas on the topic, and to develop good driving questions and focus for their inquiry. A structured inquiry should be short and focused, with the process of inquiry made clear to students such as methods to adopt when addressing the question or problem concerned. It is useful in helping students develop the essential skills in information gathering and management.

- ***Guided Inquiry (Level 3)***

Teachers have to work very closely with students to ensure that they can follow the process of inquiry designed by themselves. Teachers need to be detailed in their assessment of what students are doing by having ongoing communication with them about how they are progressing, and provide constructive feedback and advice which is concrete enough for students to act on. Teachers also need to help students plan their own short enquiries by following a clear model, and advise them on the possible sources of information, skills or knowledge to use.

- ***Open Inquiry (Level 4)***

Teachers take a more reactive role when students carry out an open enquiry. At this stage, students should be able to define their own problems and questions, identify the stages in an effective process of inquiry and systematically conduct their own projects. However, teachers still need to provide support and guidance when required or requested, and assess students' progress thoroughly through dialogues and written feedback as appropriate. Open inquiry can only be successful when students are motivated by intrinsic interests and well equipped with inquiry skills at the lower levels.

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