Chapter 2  Conceptual Framework and Methodology

2.1  Conceptual Framework

Learning is primarily a constructive process involving interactions of the learner with teachers, co-learners, learning resources, and possibly others that students may come into contact with during the learning process. IT can be used as a productivity tool, a cognitive tool, a communication or community building tool to support learning within and outside the classroom. In addressing the project aims, an ICT\(^3\) literacy and curriculum framework as shown in Figure 2.1 is adopted for conceptualizing the impact of IT on students’ learning in the identified KLAs and to evaluate the effectiveness of the Strategy with respect to the data garnered in relation to the implementation measures of information technology in education.

Figure 2.1  Diagram showing the relationship amongst ICT literacy, learning in the KLAs and factors affecting the use of ICT

In this framework, ICT literacy is not the same as technical competence. In other words, just being technologically confident does not automatically lead to critical and skillful use of information. Technical know-how by itself is inadequate; individuals must possess the cognitive skills needed to identify and address various information needs and problems. In Figure 2.1, it is clearly shown that in this framework, ICT literacy includes both cognitive and technical proficiency. Cognitive

\(^3\) The terms ICT and IT are interchangeable which means information communication technology.
Proficiency refers to the desired foundational skills of everyday life at school, at home, and at work. Literacy, numeracy, problem-solving, and spatial/visual literacy demonstrate these proficiencies. Technical Proficiency refers to the basic components of information literacy. It includes foundational knowledge of hardware, software applications, networks, and elements of digital technology.

The document *Learning to Learn: the Way Forward in Curriculum Development* published by the Curriculum Development Council in June 2001, which acts as the basis for the curriculum reform efforts currently underway in Hong Kong, specifies that the overarching principle for the reform is to “help students Learn to Learn, which involves developing their independent learning capabilities leading to whole-person development and life-long learning” (p. 10). It recommends that learning and teaching in the eight KLAs should aim not only to bring about knowledge and understanding in the requisite subject matter, but very importantly the development of nine generic skills, as these are fundamental in helping students to learn to acquire, construct and apply knowledge to solve new problems. One of the nine generic skills is information technology skills. Furthermore, the same document recommends teachers to make use of four key tasks to “help students develop independent learning capabilities through KLAs and across KLAs more readily” (p. 83). One of these four key tasks is IT for interactive learning. This key task plays an important role in supporting the achievement of the curriculum reform goals through helping students to develop the requisite IL competences. Some of the mechanisms for the development of information literacy competence through the use of IT for interactive learning are spelt out in the Learning to Learn curriculum reform document (p. 88):

- Providing audio/visual aids for difficult concepts;
- Searching for information from various sources and handling large quantities of information;
- Interaction between the learners, resources and teachers;
- Collaboration between learners and teachers; and
- Facilitating the acquisition of information, the development of critical thinking and knowledge building.

In addition, factors that would have impact on students’ use of ICT in their learning are presented in the outermost layer in Figure 2.1. These factors are related to the 7 strategic goals in ITEd. One of the objectives in this study is to evaluate the impact of IT on empowering students’ learning in Chinese and Mathematics at primary school level as well as Chinese and Science at secondary school level and in special schools which is directly addressing the first strategic goal “empowering learners with IT” in the Strategy. As can be seen in Figure 2.1, the two factors “teachers’ pedagogical practices with IT” and “teachers’ IT competency and perceptions of ITEd” are exploring issues concerning the second strategic goal “empowering teachers with IT”. The “school leadership” factor is related to the third strategic goal “enhancing school leadership for the knowledge age”. The factors “digital resources” and “improving IT infrastructure and pioneering
“pedagogy” are related to goals 4 and 5 of the Strategy respectively. Besides, the study itself is a research project on ITEd which will contribute knowledge and experience on the effectiveness of the Strategy as well as impact of IT on students’ learning outcomes. In other words, strategic goal 6 “providing continuous research and development” will be emphasized. Finally, the factor on “community head’s perception of ITEd” will provide useful information on the seventh strategic goal “promoting community-wide support and community building”.

It is also believed that ICT literacy is an essential competence which should be integrated into different KLAs. Three KLAs namely, Chinese Language Education, Mathematics Education and Science Education will be included in this study. To conclude, information literacy is an important dimension in the learning outcomes arising from student learning in all KLAs and this dimension is important to the preparation of students’ life-long learning abilities.

### 2.2 Defining Information Literacy

There is a proliferation of literature on information literacy (IL). According to Kuhlthau’s (1987, p. 2) definition, IL is, by nature, a form of technical literacy. It includes the ability to read and use information that is essential for everyday life, recognize information needs and seek information to make informed decisions.

However, in the knowledge society, only acquiring technical literacy is not enough. A much broader range of abilities than technical skills is required. In the feasibility study for the PISA (Programme for International Student Assessment) IT literacy assessment report, the Organisation for Economic Cooperation and Development (OECD) (2003) defines IT literacy as

’ve the interest, attitude and ability of individuals to appropriately use digital technology and communication tools to access, manage, integrate and evaluate information, construct new knowledge and communicate with others in order to participate effectively in society.’ (p. 8)

In this study, the OECD’s definition of IL is adopted.

### 2.3 Instrumentation

#### 2.3.1 Developing Indicators for Evaluating Information Literacy

In considering appropriate indicators for evaluating the impact of ICT on specific KLAs, several major frameworks developed in different countries for the assessment of ICT literacy have been carefully reviewed. These include “Information Literacy Framework for Hong Kong: building the capability of learning to learn in the information age - Information Literacy Framework for Hong Kong Students” (EMB, 2005) in Hong Kong, “Digital transformation: A framework for ICT
Literacy” (ETS, 2002) in the United States and “National Survey of Information and Communications Technology Literacy” (MCEETYA, 2005) in Australia. On the basis of the review, it is found that the framework developed by ETS will be the most amenable for operationalization into assessment instruments with corresponding indicators for the current study. Table 2.1 presents the details of the seven dimensions of IL competence.

<table>
<thead>
<tr>
<th>Table 2.1 Dimensions of IL in this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define</td>
</tr>
<tr>
<td>Access</td>
</tr>
<tr>
<td>Manage</td>
</tr>
<tr>
<td>Integrate</td>
</tr>
<tr>
<td>Create</td>
</tr>
<tr>
<td>Communicate</td>
</tr>
<tr>
<td>Evaluate</td>
</tr>
</tbody>
</table>

Each dimension is further elaborated to identify different levels of observable performance. An IL framework with 4 levels of performance ranging from Novice to Advanced has thus been developed (see Appendix 2.1 for details) by the Project Team. This framework can be used to guide the development of subject-specific IL indicators and corresponding assessment tasks in the performance assessments (PAs) across the various KLAs.

2.3.2 Developing an Online Assessment Platform

There is a need to ensure that students in all schools can have access to a uniform computing environment for the valid comparison of achievement in performance tasks involving the use of ICT. This is thus a major challenge for the Project Team. (The lack of a uniform technology platform is also posing serious challenges to the introduction of online learning environments to schools.) The assumption of a computer platform that is generic enough to ensure that the educational applications designed can actually be installed in all schools is virtually impossible because of the complexity and diversity of ICT infrastructure in local schools. This problem is further aggravated by the lack of technical expertise in some schools such that there are often a lot of restrictions imposed on the functionalities available to students such as disabling the right-click key which will make some educational applications non-operable, and the absence of common plug-ins and applications such as Active-X and Java runtime engines so that many educational applications cannot be executed. In addition, many technical assistants are not able to troubleshoot to identify problems when difficulties occur.

The need for uniformity is particularly acute in the case of assessing students’ task performance
using a variety of digital tools. Without a uniform technology platform in terms of the network connections and tools available, it is not possible to conduct fair assessment of students’ performance, a task which is becoming increasingly important so as to provide authentic assessment of students’ ability to perform tasks in different subject areas that can make use of digital technology.

In order to solve this problem, the Project Team has conducted much exploration and finally decided on the use of a remote server system - the Microsoft Windows Terminal Server (WTS). This requires the computers in participating schools to be only used as thin clients, i.e. dumb terminals, during the assessment process. It provides a unique and identical Windows’ environment for every single user. Every computer in each participating school can log into the system and be used in the same way. In short, all the operations are independent for each client user and functionalities are managed from the server operating system. Students and teachers can take part in learning sessions, surveys or assessments at anytime and anywhere without worrying about the configurations of the computers which they work from. In addition to independent self-learning, collaborative learning with discussion can also be conducted within the WTS.

2.3.3 Developing Online Performance Assessment Tasks

2.3.3.1 An overview

A total of 5 sets of performance assessment (PA) tasks, answering keys and scoring rubrics are developed for this project. They are:

1. PA Tasks, Answering Keys and Scoring Rubrics on IL – Technical (Primary 5 & Secondary 2) in Appendix 2.2
2. PA Tasks, Answering Keys and Scoring Rubrics on IL – Mathematics (Primary 5) in Appendix 2.3
3. PA Tasks, Answering Keys and Scoring Rubrics on IL – Science (Secondary 2) in Appendix 2.4
4. PA Tasks, Answering Keys and Scoring Rubrics on IL – Chinese Language (Primary 5) in Appendix 2.5
5. PA Tasks, Answering Keys and Scoring Rubrics on IL – Chinese Language (Secondary 2) in Appendix 2.6

Each set of the PAs is designed according to the following criteria:

- The scenarios designed for each PA are authentic to students’ daily life experiences.
- All the PAs are designed in line with the curriculum and respective grade levels. However, the same Technical PA is used at both primary and secondary levels based on the assumption that levels of technical literacy may not be bounded by school levels.
- The duration for each PA is 45 minutes.
- The full score for each PA is 50.
• The score for each question in each PA is approximately proportional to the time allocation.
• Each PA includes tasks with regard to the seven dimensions of IL. However, the levels of achievement for each dimension and the number of tasks in each dimension vary across different subject disciplines with respect to their subject nature.
• For each PA, general guidelines will be given at the beginning of the assessment to the students for answering the questions. Besides, the approximate completion time for each main question is indicated at the end of the question in each PA.

Finally, scoring rubrics together with students’ sample work for each PA have been developed. The score and item allocation in each PA is presented in Table 2.2. For each set of scoring rubrics, four levels of students’ achievements in each IL dimension are rated. The four levels are novice, basic, proficient and advanced. Each question has been indicated with the expected highest score that students may achieve.
<table>
<thead>
<tr>
<th>IL Rubrics &amp; Levels</th>
<th>Define</th>
<th>Access</th>
<th>Manage</th>
<th>Integrate</th>
<th>Create</th>
<th>Evaluate</th>
<th>Communicate</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Novice</td>
<td>Basic</td>
<td>Proficient</td>
<td>Advanced</td>
<td>Total</td>
<td>Novice</td>
<td>Basic</td>
<td>Proficient</td>
</tr>
<tr>
<td>Total No. of Questions / Scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mathematics</td>
<td>0 0 0 3 3</td>
<td>0 1 2 6 9</td>
<td>0 2 4 3 9</td>
<td>0 2 0 12 14</td>
<td>0 8 0 8 4</td>
<td>0 4 0 4 0</td>
<td>0 0 0 3 3</td>
<td>50</td>
</tr>
<tr>
<td>Chinese Language (P5)</td>
<td>0 0 3 3</td>
<td>0 0 1 4 14</td>
<td>0 2 4 0 6</td>
<td>0 0 4 3 7</td>
<td>0 0 2 5 7</td>
<td>0 0 0 6 6</td>
<td>0 1 6 0 7</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Chinese Language (S2)</td>
<td>0 0 2 0 2</td>
<td>0 0 6 6 12</td>
<td>0 3 2 4 9</td>
<td>0 0 6 4 10</td>
<td>0 0 2 4 6</td>
<td>0 0 0 6 6</td>
<td>0 3 2 0 5</td>
<td>50</td>
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<tr>
<td></td>
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<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Science</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0 0 0 9 9</td>
<td>0 0 0 6 6</td>
<td>0 2 0 6 8</td>
<td>0 0 0 15 15</td>
<td>0 0 0 3 3</td>
<td>0 0 0 6 6</td>
<td>0 0 0 3 3</td>
<td>50</td>
</tr>
</tbody>
</table>
2.3.3.2 Performance Assessment on Information Literacy – Technical (Primary 5 & Secondary 2)

For technical literacy, the scenario is planning a trip for grandfather and grandmother to visit Hong Kong. Students need to finish a total of four questions within 45 minutes in the PA. Appendix 2.2 shows the details of the PA and the scoring rubrics. The same PA is used at both primary and secondary levels. The rationale for using the same PA is based on the assumption that levels of technical literacy may not be bounded by school levels.

2.3.3.3 Performance Assessment on Information Literacy – Mathematics (Primary 5)

For Mathematics, the scenario is a visit to the Ocean Park. The subject contents involving learning dimensions on Number, Measures, Data Handling as well as Shape and Space are included in the 1st Pre-pilot Study. However, after the pre-pilot and the pilot studies, it is found that due to the time limitation and students’ weak performance on Data Handling, it is decided not to include questions in the Data Handling dimension. Therefore, only the Number, Measures as well as Shape and Space dimensions are included in the PA and students need to finish a total of six questions within 45 minutes. Appendix 2.3 shows the details of the PA and the scoring rubrics.

2.3.3.4 Performance Assessment on Information Literacy – Science (Secondary 2)

For Science, the scenario is a visit to the Kadoorie Farm. The subject contents included the learning units 2 (Looking at living things) and 7 (Living things and air) in the science curriculum in secondary 2. Students need to finish a total of seven main questions within 45 minutes in the PA. Appendix 2.4 shows the details of the PA and the scoring rubrics.

2.3.3.5 Performance Assessment on Information Literacy – Chinese Language (Primary 5 & Secondary 2)

Students learn Chinese Language with regard to ‘reading’, ‘writing’, ‘listening’ and ‘speaking’ dimensions. Compared to ‘reading’ and ‘writing’, ‘listening’ and “speaking” are less practical to be included in this IT-related PA given the constraints in many school computer room settings. Therefore, only ‘reading’ and ‘writing’ dimensions are included in the PAs for both primary and secondary levels. There are four questions in the primary 5 (P5) PA and the scenario is the Chung Yeung Festival. There are five questions in the secondary 2 (S2) PA and the scenario is about idioms and allusions. Appendices 2.5 and 2.6 show the details of the PAs and respective scoring rubrics at the primary and secondary levels.

2.3.4 The Survey Component

2.3.4.1 An Overview

The interest in finding out the impact of IT on students’ learning in specific KLAs is not only an end in itself, but is also providing a key benchmark for evaluating effectiveness of the
Strategy. Therefore, in addition to the PAs, the study has to examine relationships amongst important indicators for the strategic ITEd goals at the school level such as curriculum goal in using ICT, resource allocation, teachers’ practices and students’ practices as well as the technical proficiency and IL competence outcomes in specific KLAs.

Four survey questionnaires, namely Student Questionnaire (Appendix 2.7), Teacher Questionnaire (Appendix 2.8), School Head Questionnaire (Appendix 2.9) and Information Technology Coordinator (ITC) Questionnaire (Appendix 2.10), were administered to provide indicators on students’ background and their usage of ICT for learning, school leadership, IT infrastructure and support measures for pioneering pedagogy in the schools from which the participating students were sampled, as well as the pedagogical practices, the IT competence and perception of the roles and usage of IT for the teachers teaching the sampled students in the KLAs in which the students’ IL competence was measured. Before designing the questionnaires, the Project Team had reviewed those questionnaires in Phase (I) Study, to make sure that there was no replicated data collected in Phase (II) Study.

The Student Questionnaire was specifically designed for the purpose of this study to provide information on students’ background as well as some data related to the first and second strategic ITEd goals, “empowering learners with IT” and “empowering teachers with IT”. For the other three questionnaires, the respective questionnaires designed for the SITES3 2006 study were adopted for this study. SITES 2006 was an international comparative study conducted under the auspices of the International Association for the Evaluation of Educational Achievement (IEA). The aims of SITES 2006 were precisely to find out the extent to which ICT was used in education, how it was used and how it supported and enhanced pedagogical practices. SITES 2006 comprised two survey components: a survey of schools (including School Head Questionnaire and ITC Questionnaire) and a survey of Mathematics and Science teachers of students in their eighth year (secondary 2) of schooling. Detailed design of each questionnaire will be elaborated in the following sections.

For this study, School Head Questionnaire, Teacher Questionnaire, ITC Questionnaire and Student Questionnaire, were set for the primary and secondary (for both secondary and special schools) levels. Some of the question items were modified with respect to the school level and subjects.

### 2.3.4.2 Student Questionnaire

The purpose of Student Questionnaire was to collect students’ background information on using computer in their learning. Students were required to complete an online questionnaire in about 30 minutes.

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3 Second Information Technology in Education Studies
There were 31 questions covering various aspects of the students in primary 5: Information about You, The Use of Computer in School, About Your Mathematics Lessons and About Your Chinese Lessons.

There were 31 questions covering various aspects of the students in secondary 2: Information about You, The Use of Computer in School, About Your Science Lessons (secondary) and About Your Chinese Lessons (secondary).

Appendix 2.11 shows the details of the indicators in this questionnaire.

2.3.4.3 Teacher Questionnaire

The aim of Teacher Questionnaire was to collect information on the usage of ICT for learning and teaching from teacher’s perspective. It was assumed that teachers would take approximately 30 minutes to complete this questionnaire.

There were 39 questions covering the following aspects (for both primary and secondary levels): Information about the Target Class, Curriculum Goals, Teacher Practice, Student Practice, Learning Resources and Tools, Impact of ICT Use, Information about You and Your School as well as Specific Pedagogical Practice that Uses ICT. Appendix 2.12 shows the details of the indicators in this questionnaire.

2.3.4.4 School Head Questionnaire

School Head Questionnaire aimed at collecting information on policy matters related to pedagogical practices, infrastructure and support as well as school leadership in ITEd. It was assumed that school heads would take approximately 30 minutes to complete this questionnaire.

There were 30 questions covering the following aspects: Pedagogy at Your School, Pedagogy and ICT in Your School, Staff Development for Teachers and the School Leadership, Pedagogical Support for Persons Using ICT, Obstacles, Organisation of Learning, School Characteristics and Personal Background Information. Appendix 2.13 shows the details of the indicators in this questionnaire.

2.3.4.5 ITC Questionnaire

The aim of ITC Questionnaire was to collect information on the resources and support in schools. It was assumed that ICT coordinators would take approximately 30 minutes to complete this questionnaire.

There were 19 questions covering the following aspects: ICT in Your School, Resource Materials and Hardware, Staff Development, Support Facilities for ICT and Obstacles.
Appendix 2.14 shows the details of the indicators in this questionnaire.

2.4 Administration

There were three main stages in this project. Stages one and two were the Pre-pilot Study and Pilot Study respectively. Stage three was the Main Study.

2.4.1 Pre-pilot Study

The aim of the Pre-pilot Study was to ensure validity of the instruments. The pre-pilot of the Student Questionnaire survey was conducted in two primary schools and two secondary schools in late May 2006. The 1st Pre-pilot Study of the PAs for technical literacy as well as IL of Science, Chinese Language and Mathematics were conducted in 4 secondary schools and three primary schools from late June 2006 to early July 2006. In order to ensure the quality of the PA tasks, the 2nd Pre-pilot Study on the 5 sets of revised PA tasks was conducted in 3 primary schools and 2 secondary schools around mid-September 2006. A school visit was conducted before the Pre-pilot Study in each participating school for system checking. The Project Team had made extensive observations during the Pre-pilot Study. After the completion of the pre-pilot, a follow-up focus group interview with some of the randomly selected students was held to solicit their views on difficulties in completing the questionnaire as well as technical problems encountered during the PAs.

A website (with the URL: http://ts.cite.hku.hk/instruction) clearly providing instructions on the technical set-up for accessing the CITE remote desktop was created in mid-June 2006 for the pre-pilot in schools. The Project Team asked the pre-pilot schools to follow these instructions to set up their computers for use in the pre-pilot.

2.4.2 Pilot Study

To ensure that instruments could fully address the objectives of the study, a Pilot Study was conducted in 5 primary schools and 6 secondary schools from October to early November 2006. The aim of the Pilot Study was to validate 5 sets of PAs and the Student Questionnaire as well as to rehearse related logistic arrangements of the Main Study. Similar to Pre-pilot Study, a website (with the URL: http://ts.cite.hku.hk/instruction) clearly providing instructions on the technical set-up for accessing the CITE remote desktop was created. The Project Team asked the pilot schools to follow these instructions to set up their computers for use in the pilot.

Before the PAs, students were divided into three groups. Each group of students was given two sets of PAs and a Student Questionnaire to be completed within 2 hours and 15 minutes.
2.4.3 Main Study

The Main Study was conducted from December 2006 to early April 2007. Letters (including the letters to the School Head, School Coordinator, Subject Teachers and ITC) informing the participating schools of the detailed logistic arrangements and instructions for system set-up for the Main Study were sent out in early November 2006.

Training for the invigilators of the Main Study was conducted in late November 2006. Invigilators were required to go through the ‘Handbook for the Invigilators’ in details. There were at least two invigilators to conduct the data collection in each of the sampled schools. An online calendar was set up for both the Project Team and the EMB to access and update the Main Study schedule more easily in early November 2006. In order to ensure that the same instructions were given to the students in each school, the chief invigilators were requested to give a short briefing according to the instruction PowerPoint.

Two sets of students’ login were created for each school. One would be for normal use and another would be reserved for back-up. After the assessments, invigilators were required to submit their invigilators’ reports within 2 working days.

During the Main Study, schools reflected that it was difficult for them to arrange a 2 hours 15 minutes time slot for conducting the PAs. Therefore, some schools had conducted the Main Study in 2 to 3 days. Table 2.3 shows the details.

<table>
<thead>
<tr>
<th>School Type</th>
<th>No. of schools conducted the Main Study</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In 1 day</td>
</tr>
<tr>
<td>Primary</td>
<td>33</td>
</tr>
<tr>
<td>Secondary</td>
<td>26</td>
</tr>
<tr>
<td>Special</td>
<td>3</td>
</tr>
</tbody>
</table>

2.5 Data Analysis Method

In order to answer the eight research questions, data were collected from two main sources. They were the 5 sets of PAs and 4 sets of questionnaires. In the following sections, the workflow of the analysis will be presented.

2.5.1 Workflow of Marking of Performance Assessments

For each PA, students’ responses were collected into the database. Markers were required to mark the students’ scripts according to the scoring rubrics. There were seven dimensions of IL: “define”, “access”, “manage”, “integrate”, “create”, “communicate” and “evaluate” to be
assessed. For each PA, altogether 8 scores were computed. Seven of the indicators were the respective score for each of the 7 IL dimensions and the 8th indicator was the “total” score. Thereafter, student score in each of the IL dimensions and the “total” score would be used for further quantitative analysis. As most of the items were constructed-response questions, it is critical that each student response should be treated with the same consistent scoring rubrics, regardless of the marker. Therefore, the following measures were taken to ensure reliability in all subjects:

- The marker should be knowledgeable in Mathematics, Chinese (i.e. Chinese Language), Science and Technical curriculum areas or someone who had taught at primary schools and secondary schools.
- One and a half day training had been arranged for the markers to familiarize themselves with the application of the scoring rubrics.
- Markers were grouped into teams of two headed by the subject leaders and each team member was requested to mark 60 student scripts (which had already been marked by the subject leader) in the marker training sessions. The subject leaders’ primary responsibility was to monitor scoring reliability by continually checking and rechecking the scores given by the markers. Markers would also discuss among themselves. Such training was to detect any misunderstanding of the scoring rubrics and for clarification and rectification of mistakes.
- Thereafter, each marker was asked to mark another 40 student scripts individually, check the scores with his / her teammate and discuss when discrepancies were found.
- The level of agreement between the scores assigned by the two markers of each team was a measure of the reliability of the scoring process and the results would be reported in the next chapter.

2.5.2 Analysis of Performance Assessments and Questionnaires

The following analyses on the PAs were performed:

- The basic descriptives for the 8 IL indicators of Technical PA, Mathematics PA, Primary and Secondary Chinese Language PAs and Science PA were computed to find out the level of IL proficiency that students had achieved. The weighted student data for primary and secondary schools were used for the descriptive analysis. As there was only a small amount of data collected in the special schools, no weighting was applied.
- Samples of students’ work illustrating the different levels of expertise were selected and described.
- ANOVA was conducted on each of the 8 indicators to test whether there were any significant differences across schools.
- ANOVA was also conducted to compare the results of the technical PA at the two different education levels, namely, primary 5 (P5) and secondary 2 (S2).
• Pearson Correlation analysis was used to test whether there were any relationships between the IL competence of students and their technical proficiency.

The following analyses on the four sets of questionnaires were performed:
• Computation of the basic descriptives for School Head Questionnaire, Teacher Questionnaire, ITC Questionnaire and Student Questionnaire was performed.
• Descriptive analysis on school level factors (based on School Head Questionnaire, ITC Questionnaire and Teacher Questionnaire) such as pedagogical practices and the use of ICT, priority of resource allocation and resource support provided by ICT coordinator would also be explored.
• Factors constructed by factor analyses from SITES 2006 were used to further analyse data collected from School Head Questionnaire and Teacher Questionnaire in this study.

The following analyses on the PAs and questionnaires were performed:
• ANOVA was conducted to examine significant differences in students’ PA performances with regard to their gender, years of computer use, access to computer at home and duration of daily computer use at home.
• ANOVA was conducted to examine significant differences in PA performances across schools, with regard to their medium of instruction, ability grouping, school location, school sex and operational session.
• The Project Team also intended to explore the possibility in using multilevel analysis to see if there were relationships between the school level factors (based on School Head Questionnaire, ITC Questionnaire and Teacher Questionnaire) and the students’ IL competence scores as measured in Technical PA and in different KLA-based PAs. However, due to the small amount of data collected in the three questionnaires, data could not be converted.

Finally, the Project Team would also review the relevant findings and recommendations of Phase (I) study to compile the recommendations for this study.